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ABSTRACT

High attrition in technical training courses in Army Service Schools was found to be a major problem during the years 1962 to 1965. Data obtained at the U.S. Army Air Defense School showed that students who volunteered specifically for their training had significantly lower attrition rates than students of comparable aptitude who were assigned to the courses without having volunteered. These data were highly suggestive of a motivational factor in the prevalently high attrition rates and indicated a need for improving student motivation. The objective of this Work Sub-Unit was to evaluate group competition as a means of improving or maintaining student motivation. It was hoped that the tendency of American males to compete would lead to strong group identification, and a resultant improvement of performance. Group, rather than individual, competition was thought desirable for two reasons. First, as a member of a group the weaker student has more of an opportunity to win than he would have functioning as an individual. Secondly, it was felt that the competition might lead to the tutoring of weaker students in a group by the stronger students. The results of the research are discussed in relation to the validation of the assessment devices, the factors related to motivation and the implications to be drawn from these experimental findings. (Author/SJL)

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ED134884

Technical Report 68-7

The Effects of Group Competition Upon Student Performance

by

Albert L. Kubala and Harold E. Christensen

HumRRO Division No. 5 (Air Defense)

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June 1968

Technical Report 68-7
Work Unit SPUR
Sub-Unit I

The Human Resources Research Office is a nongovernmental agency of The George Washington University. The research reported in this Technical Report was conducted under contract with the Department of the Army (DA 44-188-ARO-2). HumRRO's mission for the Department of the Army is to conduct research in the fields of training, motivation, and leadership.

The findings in this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

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FOREWORD

A brief study of causes of attrition in technical training programs was undertaken by HumRRO Division No. 5 (Air Defense) in FY 1964. Preliminary evidence indicated that motivational factors had a relatively strong influence on school achievement. In FY 1965 an Exploratory Study (ES-32) in the area of motivation was initiated. Work Unit SPUR was initiated in FY 1967 to test some promising means of improving or maintaining student motivation during training. This report deals with Work Sub-Unit SPUR I, in which the effects of group competition were explored.

This research was conducted by HumRRO Division No. 5 (Air Defense) under Dr. Robert D. Baldwin, Director of Research. The U.S. Army Air Defense School provided facilities and support for the research. Numerous members of the staff of the Electronics Department of the School provided guidance during planning.

MAJ Alexander D. Bell, Chief of the U.S. Army Air Defense Human Research Unit, served as military coordinator. SP 4 George Nelson of the Human Research Unit was the clerical and statistical assistant.

HumRRO research for the Department of the Army is conducted under Contract DA 44-188-ARO-2 and Army Project 2J024701A712 01, Training, Motivation, Leadership Research.

Meredith P. Crawford
Director
Human Resources Research Office

SUMMARY AND CONCLUSIONS

Military Problem

High attrition in technical training courses in Army Service Schools was found to be a major problem during the years 1962 to 1965. Data obtained at the U.S. Army Air Defense School showed that students who volunteered specifically for their training had significantly lower attrition rates than students of comparable aptitude who were assigned to the courses without having volunteered. These data were highly suggestive of a motivational factor in the prevalently high attrition rates and indicated a need for improving student motivation.

Research Objectives

The objective of this Work Sub-Unit was to evaluate group competition as a means of improving or maintaining student motivation. It was hoped that the tendency of American males to compete would lead to strong group identification, and a resultant improvement of performance. Group, rather than individual, competition was thought desirable for two reasons. First, as a member of a group the weaker student has more of an opportunity to win than he would have functioning as an individual. Secondly, it was felt that the competition might lead to the tutoring of weaker students in a group by the stronger students.

Method

Students in the experimental classes were divided into four groups, matched on factors that were shown to be related to success in training in previous classes. Groups were paired for competition, and the pairings were changed every two weeks so that every group competed with every other group. The basis for competition was the regularly scheduled weekly examinations. The group in each pairing that failed the fewest exams was declared the winner for that particular competition; thus there were two winning groups during each competition period.

Minor incentives were provided the members of the winning groups. Each individual had a choice of a theater ticket or a ticket good for use at the Post bowling alley. Also, the names of all men in winning groups were published in the *Fort Bliss News*. News articles were sent to hometown newspapers for all members of the single group that had the best overall record after two competitions, and letters of commendation were sent to the parents of all members of the group that had the best overall record after four competitions.

A questionnaire was developed to measure motivation for training prior to the experiment. Also used was a set of peer ratings that included "Familiarity," "Friendship," "Leadership," "Ability," and "Desire to Succeed in Training." Several means of scoring the peer ratings were tried. The questionnaire and peer ratings were administered to experimental classes just prior to the first written exam and just after the fourth written exam in both experimental classes.

Substantial changes in input in technical training courses during the fall of 1966 resulted in greatly reduced attrition in these courses. These changes made it much more difficult to evaluate a program that was aimed primarily at improving the performance of borderline students. Therefore, the effort was terminated after only two classes had received the experimental treatment.

Results and Discussion

Measurement Devices. Both the questionnaire and the peer rating of "Desire to Succeed in Training" proved to be valid predictors of success in training. In general, the importance of motivation relative to aptitude seemed to be greater in predicting success on laboratory or practical exams than on written exams.

Effects of Competition on Performance. It was hypothesized that group competition would improve performance, and that the greatest improvement would be evidenced by the weaker students. Final averages of men in upper and lower thirds of the GT distribution from the experimental classes were compared with equivalent aptitude groups from control classes. The mean score of the lower aptitude experimental group was approximately six points higher than that of the controls, while the means of the two higher aptitude groups differed by less than one point. A comparison between the lower aptitude students in the experimental and in the control groups revealed that 6 of the 20 experimental students (30%) failed to achieve a 70 average in comparison with 39 of the 75 control students (52%). This difference was statistically significant.

The practical exam average was significantly lower than predicted from GT scores in one experimental class, and significantly higher than predicted in the other. This was taken as evidence of differing motivation in the two experimental classes. Furthermore, the classes differed significantly on original questionnaire scores, again indicating a difference in motivation. Since there were some variations in the treatment of the two classes, and since the results in the two were somewhat contradictory, caution must be applied in interpreting the results obtained. However, it does appear that, at least under certain conditions, group competition can influence the performance of lower aptitude students.

Additional Results. It was found that the competition did influence the formation of personal friendships. The number of within-group friendship choices exceeded expectancy in both experimental classes, and was significantly greater than chance in the second class. It was also found that members of losing groups tended to lose confidence in other members of their groups. In winning groups, the number of within-group choices in "Ability" and "Desire to Succeed in Training" increased between the first and second testing, while in losing groups, the number of within-group choices in these two ratings decreased.

Sociograms indicated that the social structure of the classes was quite well defined even before the first week examination. However, no relationship could be found between personal friendships or clique membership and factors related to success.

Conclusions

The results obtained appear to warrant the following conclusions:

(1) It is possible, at least under certain conditions, to improve the academic performance of lower aptitude students through the use of group competition.

(2) It is possible to measure motivation (i.e., desire to succeed in training) by means of either peer ratings or a short, specially designed questionnaire. The questionnaire has the advantage of making it possible to compare one class with another, while the "forced choice" technique used in obtaining the peer ratings makes this impossible, because the raters must make comparisons of specifically named people.

(3) Placing men in groups for competition does have a significant effect on the formation of friendship choices. However, the effect was not pronounced enough to cause clique formation to center around the competitive groups.

(4) Neither similar motivation nor similar aptitude is the basis for individual friendship choices. Reasons for friendship choices lay outside those variables measured in this study.

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The Effects of Group Competition Upon Student Performance

BACKGROUND

Military Problem

Each year the Army increases its capability through the addition of more varied and more complex hardware. One result of this development is an ever-increasing requirement for highly trained personnel to operate and maintain such equipment. The training necessary to meet these demands involves time-consuming training courses and technically complicated equipment, resulting in substantial expenditures. It has been estimated that electronics training, which constitutes a large portion of the Army's technical training, costs $50 a man-week.[1]

Attrition, therefore, becomes a very costly factor in such courses, and this is particularly evident in the longer and more expensive training programs, in which the highest attrition rates have been experienced. Data compiled from U.S. Continental Army Command attrition records (Table 1) show a positive relationship between course length and the proportion of courses with attrition rates of 20% or higher in FY 1965. Although the cause-and-effect relationships are uncertain, it would appear that the courses in which the Army is making the greatest monitary investment are the ones experiencing the most severe attrition problem.

Table 1

Relationship Between Attrition and Course Length[a]

Course Length (Weeks)	Number of Courses	Courses With 20% or Higher Attrition	
		Number	Percent
Under 20 Weeks			
Under 10	62	4	6.5
10-14	77	26	33.8
15-19	26	11	42.3
Average			24.8
20 Weeks and Over			
20-24	16	11	68.8
25-29	16	14	87.5
30 and Over	16	14	87.5
Average			81.3

[a]Material drawn from U.S. Continental Army Command attrition records (1).

High attrition results from many causes, only one of which is lack of motivation. Even motivation cannot really be considered a single entity. Motivation, or the lack thereof, has multiple causation. Therefore, for purposes of this research, motivation is defined as the desire (for whatever reason) to succeed in training. Motivation will be assessed on the basis of self and peer evaluations. Such assessments are subject to considerable error, but they are the only means available for assessing motivation as specific as that desired in this research.

Data from the U.S. Army Air Defense School have shown that motivation, as evidenced by a stated desire for training, plays a significant role in success. A comparison of attrition rates for men who volunteered for training at the Air Defense School and men who were assigned to the courses without having volunteered

[1]Information taken from United States Continental Army Command Letter, File: ATIT-SCH-EA, Subject: *Study of Basic Electronics Instruction*, HQ, USCONARC, Fort Monroe, Va., 30 January 1964.

is shown in Figure 1. The data are based on a total of 588 privates who entered Hawk missile system maintenance courses. Attrition is shown as a function of aptitude level, as measured by the Electronics aptitude area (EL) score from the Army Classification Battery (ACB).[1] Attrition appears to be between 15 and 20% less for volunteers at any aptitude level. Furthermore, supplementary interview data indicate that not all volunteers have a strong desire to succeed, and that some non-volunteers do. Hence, the difference shown in Figure 1 is probably an underestimate of the true difference between men who desire the training and men who do not. If so, it would seem that motivation is quite a potent factor in determining success in training.

Comparison of Attrition Rates Between Volunteers and Non-Volunteers

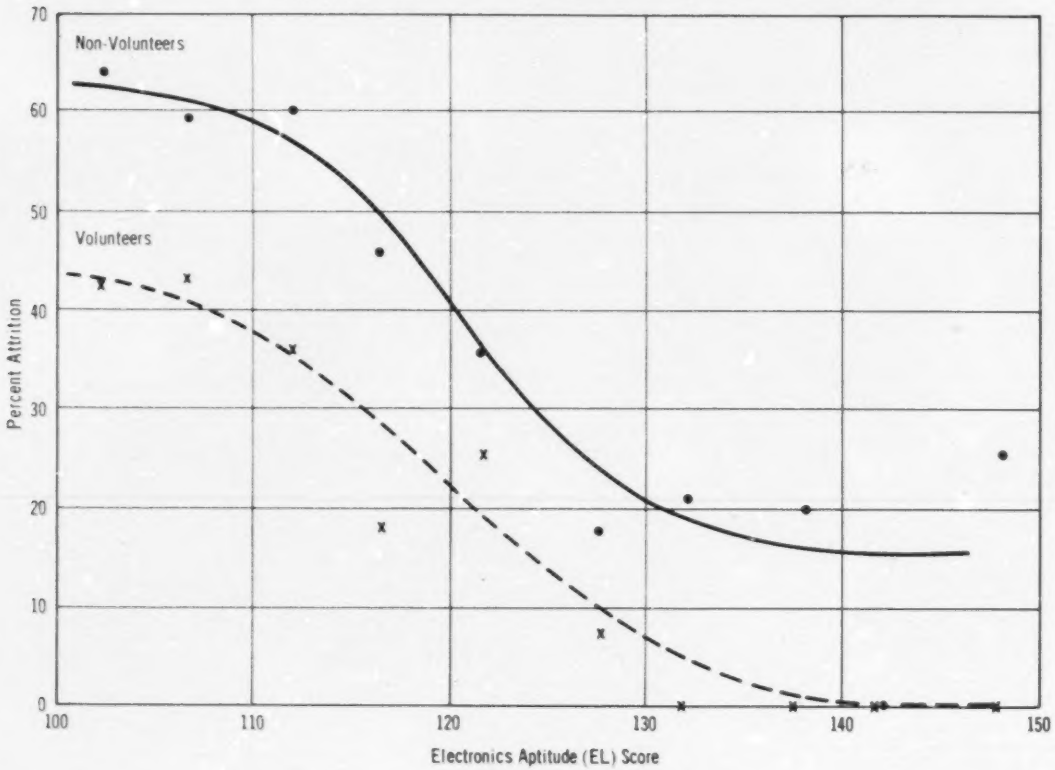

Figure 1

This study of input in Hawk system maintenance courses at the Air Defense School provided information that was useful in specifying both the origins and the magnitude of the problem. For example, attrition from all causes was averaging close to 40%, only one-third of the students in the average class were volunteers, and some 40% of the students did not meet all of the prerequisites.[2] The attrition rate alone was sufficient to indicate a problem of major proportions. The small proportion of volunteers indicated that low motivation might be a factor in the

[1]Raw scores from the Army Classification Battery are converted to Army Standard Scores, and then aptitude area composites are formed. EL is the Electronics aptitude area, and is one-third the sum of the Mechanical aptitude score plus two times the Electronics Information score [(MA + 2ELI)/3].

[2]The prerequisite most oftenwaived was the successful completion of one year of high school algebra. The prerequisites for assignment to training are set forth in DA Pamphlet 350-10 (2).

failure of a considerable number of students. The fact that such a large proportion of the students did not meet the prerequisites is a further indication of the origin of the problem. Men who neither asked for the training nor were qualified to take it could hardly be expected to have high motivation.

Inquiries were made in an effort to find out why the proportion of volunteer students was so low, and why so many men who did not meet the prerequisites had to be assigned. Some highly relevant data were found in a publication prepared by the Office of Personnel Operations (3). In a study of a one-year Army input, it was found that approximately 80% of the RA personnel entered the Army with some type of commitment. However, very few of these commitments were for MOS training in electronics or any other hard skill area.[1] Requirements for training in these areas had to be met largely by assigning men from the 20% who had not received commitments on enlistment, since draftees were not eligible for these longer courses. In general, the uncommitted manpower pool was of relatively poorer quality. Hence, a considerable shortage of qualified personnel for the hard skills resulted. Although these data provided no hints as to why the hard skill areas seemed to lack general appeal to enlistees, they did explain why so many unqualified personnel had to be assigned to training in these areas.

Following this assessment of the personnel situation at the time, it was concluded that two possible approaches to improving motivation might prove fruitful. One approach would be to make every effort during the recruiting and processing phases to locate all interested and qualified personnel and to encourage them to get into a hard skill area. The other would be to seek means of improving the motivation of men already assigned to training; this approach led to the conceptualization of the research program described in this report.

The overall situation described above was generally true from FY 1963 through FY 1965. However, in the early part of FY 1966 the personnel situation in the Army began to change rapidly. The intensification of the conflict in Vietnam and the resulting increase in draft quotas vastly changed the enlistment picture. During the latter part of FY 1965, Army enlistments were from 10 to 20% below FY 1964 levels. During the last three quarters of FY 1966, enlistments were virtually double what they had been in FY 1965.

Although training quotas were increased, the personnel situation, at least at the Air Defense School, markedly improved. The proportion of volunteer students in Hawk system maintenance courses more than doubled—some classes being composed 100% of volunteers. The percentage of students who did not meet the prerequisites dropped to about 10%, and class averages on ACB scores rose some 7 to 10 points. As was to be expected, attrition rates were affected. In seven classes undergoing training for MOS 22J (Hawk Missile Launcher Mechanic) just prior to the initiation of this study, attrition from all causes was only 15%.

Data from the two experimental classes, which were selected without any knowledge about input quality, further demonstrate the change that had taken place. Approximately 95% of the students in the experimental classes had volunteered for the training, compared to 19% of the students in the same MOS program for those classes entering into the data in Figure 1. Also, mean EL score in the experimental classes was 117.8 compared to 112.3 for the previously reported classes. It was evident that the need for which Work Unit SPUR had been designed was no longer immediate. Academic attrition had been reduced to such an extent that it would be extremely difficult to demonstrate further

[1]The Office of Personnel Operations (OPO) defines a hard skill as one requiring a minimum score of 100 in the appropriate aptitude area from the Army Classification Battery, and requiring 16 weeks or more of formal training.

reductions experimentally. Therefore, the decision was made to suspend the Work Unit after two experimental classes had completed the experimental treatment. Although the research was limited, the findings were deemed to be of sufficient value to be worth reporting.

Objectives of the Research

The overall objectives of the research were to determine what motivational factors influence attrition, and to develop methods of maintaining or improving the motivation of students undergoing technical training in Army Service Schools.

The specific purpose in Work Sub-Unit SPUR I was to determine the effectiveness of group competition as a means of improving overall motivation and reducing attrition. The research also was designed to answer some additional questions, of both theoretical and practical importance:

(1) How does motivation change during the course of training in experimental classes compared with regular classes?
(2) How does success or failure affect motivation?
(3) Is there any relationship between motivation and the formation of personal friendships?
(4) Does group competition affect the formation of personal friendships?
(5) How important is motivation relative to aptitude in determining success in training?

METHOD

Rationale

This study was based on the supposition that the majority of men in training have fairly strong needs for achievement, affiliation, and status. In other words, they have strong desires to be respected, accepted, and valued by their fellow students. It was believed that group competition was a suitable vehicle by which the environment could be manipulated to make satisfaction of the trainees' needs more dependent on adequate performance in training.

The basic plan called for dividing classes into groups of approximately equal size and aptitude, and these groups were to compete with one another on regularly scheduled weekly examinations. Token rewards were to be given each member of a winning group. Several reasons can be cited why this approach was believed to be a means of exercising some measure of environmental control:

(1) Every man is forced to compete. Because competition and the desire to win is important in our society, most people, once in competition, will put forth effort even if the competitive event is one that would not otherwise be interesting to them. It was assumed that a similar situation would exist under group competition in training. Placing every man in a group and holding formal competition among groups makes every man compete, whether it is to his liking or not. It was hoped that the student's natural need to achieve or prove his superiority would make him an active competitor.

(2) Every man has a real opportunity to win. Competing groups are closely matched on relevant aptitudes; each group has an approximately equal chance of winning. In essence, the slower student in a group is competing with the slower students from the other groups, even though winning is determined on the basis of group rather than individual performance. Thus, it was hoped that by matching the groups on aptitude, each student would consider his chances of winning to be good.

(3) Every man's performance affects the entire group. Under normal circumstances in Army Service Schools, a man's performance has little effect on his classmates. However, in group competition the fortunes of the group depend

almost equally on all members. The unwilling student is likely to be held in contempt by his fellows. Rarely can young men remain impervious to a loss of respect and status from their peers. It was suspected that the majority of men would enter into the spirit of the competition willingly, and that most of those who did not would still conform to the expected role simply to avoid losing the esteem of the group. In other words, it was believed that the man's need for affiliation would force him to play the desired role.

(4) Formal recognition can be provided winning groups. The Army Service School provides an almost ideal situation for enhancing the value of token rewards. No matter how small, rewards can be presented publicly, leaving little doubt as to who received the rewards and why. Formal recognition by authority is generally motivating in itself. The group competition approach was seen as having an additional value in this respect. The weaker student, who would have little chance of recognition as an individual, would have an equal chance as a member of a group.

The effects of competition on the performance of both individuals and groups has been a subject of study for quite some time. As early as 1927, Hurlock (4) demonstrated that competing groups performed better on arithmetic tests than non-competing groups. More recent studies (5, 6, 7) have considered the conditions under which competition does seem to be a motivating force. In general, competition has been found to work best in a "means-independent" situation—one in which the competitors are in no way dependent on each other for the means by which they accomplish their task. In situations where interdependence rather than independence exists, cooperation between individuals or groups seems to increase productivity, while competition tends to hamper productivity.

Competition as a means of motivating men is certainly not new in the military. It has been used informally in many situations, including academic settings, although more frequently in athletics or during major inspections. In HumRRO Task APTITUDE (8) it was found that intersquad competition significantly increased proficiency test scores during Basic Combat Training; the rewards provided winning squads were minimal. Therefore, it is known that competition with minimal rewards did motivate men comparable to those with whom the present research was concerned.

In group competition of the type used for this research, elements of both competition and cooperation exist. The groups are certainly independent; that is, the performance of one group is not dependent in any way on the performance of any other. Therefore, it would be expected that competition would improve performance. Members of a single group are interdependent, but they are not competitors. In fact, cooperation between group members is essential. It was hoped that the better students would recognize this interdependence, and would tutor the weaker students in their group. This alone, it was believed, might be sufficient to ensure that a larger number of the borderline students would successfully complete the training.

Experimental Procedures

Selection of Classes. Original plans called for classes to be selected from those training for MOS 23P (Hawk Fire Control Mechanic), MOS 23R (Hawk Continuous Wave Radar Mechanic), and the F-12 course, which is preparatory to a number of MOSs involved with Fire Distribution Systems. These MOSs were selected because classes normally ranged from 25-40 men, there were usually very few NCOs, and they typically had larger proportions of men in the lower aptitude ranges (where proper motivation might be a more decisive factor in success or failure).

Classes of this size were considered small enough so that the men would get to know each other quickly, yet large enough so that it should not be difficult to construct four reasonably well matched groups. Small numbers of NCOs were desired for two reasons: First, they typically are well motivated, hence, are virtually never problem students; and second, they are placed in both official and unofficial positions of leadership. The ranking NCO automatically becomes the official class leader, and his juniors typically keep him cognizant of potential academic problems.

Because of changes in school input between the time the research was planned and the time the classes were actually selected, classes from the aforementioned MOSs were not considered to be of optimal composition. Therefore, both experimental classes were selected from those training for MOS 22J (Hawk Missile Launcher Mechanic). Input to this MOS conformed more closely to that desired at the time of selection.

Group Formation. Men in each of the experimental classes were divided into four matched groups, with matching accomplished in the following manner. A predicted final Missile Electronics (ME) average was computed for each man, on the basis of regression equations derived from data on five classes that had recently completed the ME subcourse. Variables selected for trial included the Electronics (EL) and General Technical (GT) aptitude area scores from the ACB, age, education, and EPT score.[1] Separate equations were computed for volunteers and non-volunteers. In both instances, the final equations included only EL, GT, EPT, and age, education being dropped because its weighting proved to be negligible. The equation for volunteers, using weights for raw scores, was:

Predicted Average = .15 GT + .39 EPT + .09 EL − .12 Age + 38.11.

The equation for non-volunteers was:

Predicted Average = .37 GT + .49 EPT + .04 EL + .58 Age − 0.47.

The multiple regression coefficients for volunteers and non-volunteers were .72 and .76, respectively. Men were placed in groups on the basis of predicted final ME average. The spread between the means was not allowed to be greater than one point, and care was taken to distribute borderline cases (predicted final averages of 75 and below) equally among the groups.

The problem of placing NCOs proved to be minor. The first experimental class contained no NCOs. In the second experimental class there were three NCOs; since it was not possible to put an NCO in each of the four groups, it seemed advisable to omit them from the competition.

Men who were recycled into an experimental class proved to be no problem. There was only one recycled student in the first experimental class and none in the second class at the time groups were formed. The one recycled student was placed in the same way as the others, although it was thought that his obtained scores might be somewhat higher than predicted because he had had a part of the training previously. Other recycled students were not put into groups immediately. However, whenever a man was dropped from a class, his place in a group was filled by a recycled student if one was available.

Competition. The basis for competition was the regularly scheduled weekly examination. Competition between each pair of groups was conducted for a two-week period. After each competition period, the groups were paired anew for the following competition period. After three periods, or six weeks, each group had competed against each of the other groups. During the final period of ME,

[1]The EPT, or Electronics Placement Test, is an Air Defense School test. It was originally designed to predict success in Basic Electronics, now the ME subcourse. Based on several recent classes, the estimated validity of the EPT for final ME average is about .70.

the two groups with the best overall records were paired and the two groups with the poorest overall records were paired.

The winning group in each pairing was determined by the proportion of tests passed during the competition period. For example, suppose that competition had been between two groups of eight men each that had taken one laboratory exam and two written exams during the period. Each group had thus taken a total of 24 tests. If there were 22 passing scores in one group and 20 in the other, the group with the 22 passing scores was declared the winner for that period. In case of a tie in the proportion-pass criterion, the winner was the group with the higher average during the period. However, one further provision was added—that both groups would be considered winners if both had 100% pass records for this period.

There were two closely related reasons for choosing the proportion-pass criterion over group academic average as the basis for determining winning groups. First, since one of the main purposes of the research was to find means of reducing attrition, improving the scores of borderline students was considered more important than improving the scores of stronger students. Second, it was hoped that this type of criterion would result in more tutoring of weaker students. Using the proportion-pass criterion, the group's standing is more dependent upon the performance of the borderline student than it is on the average or bright student, both of whom would probably pass nearly all of the exams under any conditions.

Rewards or Incentives. It was hoped that the desire to win would be the chief motivating factor in the competition, as rewards of any real material value could not be provided. Since Army regulations place stringent controls on promotions, pay increases, and leave time, it was impossible to offer these more obvious incentives. It was not even possible to arrange a three-day pass because of scheduling difficulties. Furthermore, students had very few work details, no KP duty, and a minimum of inspections, making exemption from such things of little value. Nevertheless, it did seem as though some sort of rewards was necessary to make the competition more interesting and more meaningful.

In the search for possible rewards, it soon became apparent that various kinds of recognition for accomplishment—which could be given at virtually no cost—would have to be relied on heavily as incentives, as funds available for the purchase of material rewards were very limited. However, there was good evidence that recognition was highly valued, at least by the young soldier on a first enlistment. This evidence comes from a study by McNeil and Bialek (9). Some of the findings are shown in Table 2. The rewards are ranked in the order in which they were preferred by a group of men undergoing

Table 2

Scale of Reward Values for Men in Basic Combat Training, Ranked According to Preference [a]

Order of Preference	Item
1	Special Promotion in Rank
2	Choice of Future Assignment
3	Three Extra Days Leave
4	Three-Day Pass
5	Special Letter of Merit to Parent
6	Post "Soldier-of-the-Month"
7	Commanding Officer's Special Recognition
8	Engraved Wrist Watch From Commanding Officer
9	Top Scorer on PT Test Announced to Company
10	Presented Trophy Before Company
11	Receive Letter of Appreciation From Commanding Officer
12	Twenty Dollar Award
13	24-Hour Post Privileges for a Week
14	Battalion Commendation

[a] Material drawn from Table 2 of HumRRO Technical Report 68-6, May 1968 (9).

Basic Combat Training. As can be seen, rewards involving individual recognition frequently were more highly valued than other rewards of considerable monetary value. For example, the rewards ranked 5th, 6th, 9th, and 11th all cost virtually nothing, yet were more highly valued than a $20 award, ranked 12th. From these data, it was concluded that recognition for achievement could be a truly potent incentive in the Army Service School setting.

After consideration of the possibilities, the following list of incentives was chosen and employed during the experiment:

(1) Each member of a winning group for any of the four competition periods was given a choice of a theater ticket or a ticket good for three lines of bowling.

(2) A brief article, listing the names of members of winning groups was published in the Fort Bliss News after each competition period.

(3) The names of members of winning groups were posted on the barracks bulletin board.

(4) After two periods of competition, an article was sent to the hometown newspaper of each member of the group having the best overall record during the two periods of competition. (A copy of the article is shown in Appendix A.)

(5) At the end of the competition, a letter was sent to the parents of each member of the group having the best overall record during the four periods of competition. (A copy of this letter is shown in Appendix B.)

Development of Assessment Devices

To obtain information about some of the questions to be answered by this research, it was necessary to develop some measures of motivation and some indices of social structure. The development of each of these measures will be described separately.

Peer Ratings

Originally, four peer ratings were obtained. These were titled "Friendship," "Ability," "Leadership Potential," and "Desire to Succeed in Training." A fifth rating titled "Familiarity" was added after students in earlier classes complained of difficulty in making ratings because they were not familiar with all of the class members.

The nominating technique was used throughout, with the number of men nominated varying with the class size. In classes of 20 to 40 men, students were asked to nominate five men for "Most" and five for "Least" in each rating. With smaller classes, four men were nominated in each category, and with larger classes, six men. Students were not permitted to nominate themselves, but were asked to rate themselves as being in the first, second, third, or fourth quarter of the class on all but the "Familiarity" and "Friendship" ratings. (A copy of the peer rating forms is included in Appendix C.)

Two kinds of information were desired from the peer ratings: It was hoped that the "Desire to Succeed in Training" rating would be a valid measure of motivation, and that the "Friendship" rating would provide insights into class structure. The other ratings were included in an effort to determine how friendship influenced or affected an individual's ratings of his peers on other characteristics. This influence is commonly referred to as the "halo effect."

Considerable effort was expended trying to find the most predictive scoring scheme for the "Desire" rating. Although none of the more involved methods proved to be more useful than the simplest method, it is felt that they

should be mentioned for the benefit of others who plan to employ peer ratings. In brief, these were:

(1) An algebraic summation of nominations. To obtain each man's score for a given characteristic, the total number of "Least" nominations he received was subtracted from the total number of "Most" nominations he received. A constant was added to make all scores positive.

(2) An attempt to eliminate halo effects from the "Desire" rating by using partial correlation. A halo effect in the ratings was easily demonstrated. For example, in the first class to be tested, the correlation between "Friendship" rating and "Ability" rating was .30, based on scores derived in the manner described in (1) above. However, when GT was partialled out of the "Ability" score, the correlation of the remainder and "Friendship" rose to .51. In other words, when variance due to ability as measured by GT was removed from the "Ability" rating, a larger proportion of the remaining variance was associated with friendship. An attempt was made to remove the halo effect from the "Desire" rating by partialling out the "Friendship" rating. However, this did not increase the correlation with course grades. This finding was interpreted as meaning that men with a greater desire to succeed were also more likely to be chosen as friends by their peers. If this were the case, the "Friendship" score contained some variance associated with desire to succeed. This variance was removed in the partialling process along with that associated with friendship, with the result that the overall validity for predicting course grades remained unchanged.

(3) An attempt to eliminate halo from the "Desire" rating by weighting nominations on the basis of friendship choices. It was assumed that a rater who liked a particular individual would tend to overrate him on other characteristics. The opposite was assumed to be true for men disliked by a rater. Hence, it was assumed that the confidence that could be placed in a "Most" or "Least" nomination in "Desire" would vary depending on who made the nomination. A weighting scheme to take like-dislike into account was derived. It is based on the idea that equivalent nominations on both "Friendship" and "Desire" by the same rater are less meaningful than different nominations. The weighting system is shown below:

Friendship Nomination	Desire Nomination	Weighted Desire Nomination
Least	Most	3
None	Most	2
Most	Most	1
Least	None	1
None	None	0
Most	None	-1
Least	Least	-1
None	Least	-2
Most	Least	-3

An individual's score was the algebraic sum of the weights of the nominations he received. A constant was added to eliminate negative scores. This weighting did little to change the order of the "Desire" scores. The correlations between this score and the unweighted algebraic sum were above .95 in both classes for which the weighted score was computed. Obviously, no gain in validity could be expected.

(4) An attempt to eliminate halo from the "Desire" rating by eliminating unrealistic raters. The accuracy of an individual's nominations on the "Ability" rating could be determined by comparing his ratings to GT

scores, since the GT score is considered a quite valid measure of overall ability. The 50% of the class whose nominations for ability were most in line with GT were selected, and a new "Desire" score was computed from the ratings of these men. An individual's score was the algebraic sum of the "Most" and "Least" nominations he received from these men, with a constant added to eliminate negative scores. This score proved to be no more predictive than the score based on all nominations in either of the two classes for which it was computed. This result is difficult to interpret. It would appear that a man's capability to judge his peers varies with the characteristic being judged. Hence, a man who is a good judge of ability may not be a good judge of motivation. Also, reducing the number of raters by 50% probably affected the reliability of the ratings adversely.

(5) An attempt to improve the predictive validity of the "Desire" rating by eliminating unfamiliar ratees. It stands to reason that men are going to be able to make better judgments of men with whom they are familiar than of men with whom they have little familiarity. Examination of the peer rating data revealed that men who were low in "Familiarity" tended to receive very few nominations on the other scales. It was hypothesized that raters were reluctant to nominate a man with whom they were unfamiliar, so a lack of either "Most" or "Least" nominations could not be interpreted as meaning the unfamiliar ratee was average for the group on that characteristic. To check this hypothesis, all men who received five more nominations for "Least" than they did for "Most" were eliminated. The predictive validity of the "Desire" rating did increase in the three classes for which this was tried. This essentially confirmed the hypothesis; that is, the ratings obtained on unfamiliar persons were less predictive than for the more familiar persons. This finding, of course, did not provide a means of increasing the overall predictive validity of the "Desire" rating, but it did provide a means for judging the confidence that can be placed in any given individual's rating on the scale.

It was mentioned earlier that the peer ratings were needed to obtain information on the social structure of the class. It was hypothesized that factors related to success in training would also be a factor in the formation of personal friendships. For example, it was believed that clique (a small group of close personal friends) formation might be related to such things as attitudes toward the Army, attitudes toward training, aptitudes, age, education, or geographical location at home. The social structure of the class was determined by applying the technique described by Clark and McGuire (10) to the "Friendship" ratings.

Student Attitude Survey

A trial questionnaire was constructed that contained questions about interests, desires, intentions, and expectations, with particular reference to training and the Army. Original questions were chosen on the basis of face validity. Several classes were tested during the development and modification of the questionnaire. During development, items with very little response variation were rewritten and some items were added. After averages from the ME subcourse were available, final modifications were made on the basis of item validities. (A copy of the final form of the questionnaire is shown in Appendix D.)

In scoring the questionnaire, alternatives believed to reflect high motivation were given low scores, and alternatives believed to reflect poor motivation were given high scores for each item. Obviously, lower total scores

were considered as indicative of higher motivation. Details of the scoring procedure are shown in Appendix D.

Behavior Rating

A rating form based on a five-point scale was devised for use by the class leader. Instances of sleeping in class, disciplinary actions, tardiness, and "gigs" at inspections were to be recorded for each man. A new form was to be used each week. The behavior rating was tried in two of the classes used in developing the assessment devices, but it proved to be of no value. Recorded instances of behavior that might be indicative of motivation or a lack of motivation averaged less than one per week per class. The five-point overall rating proved useless also, because only in extreme cases did the class leaders give any man a rating other than average, and this information was already available from the peer ratings and attitude survey. As a result, this rating was discontinued.

Conduct of the Experiment

Administration of the questionnaire and peer ratings took approximately 40 minutes, although one class finished in less than 30. No verbal instructions were given with the questionnaire, although students were reminded to put their names on and were told to raise their hand if they did not understand a question. Additional instructions were given with the peer ratings in an attempt to eliminate halo from the ratings. Basically, these instructions were to caution the raters against rating a man high because they liked him, and vice versa.

The selection of times for administering the tests was considered crucial. It seemed highly desirable that the first testing precede the administration of any school examinations. Otherwise, it was feared that both the ratings and the questionnaire might reflect little more than the results of the school examination. However, it also seemed desirable to give the students ample time to interact and observe each other so that they could have some real basis for making ratings. Therefore, the day before the first school examination was chosen as the best possible date for administering the questionnaire and peer ratings.

There were also good reasons for choosing a day immediately following the fourth written examination for the final test date. Students were not normally dropped from a class until after the fourth week unless they obtained extremely poor scores on the earlier examinations. Hence, test data for both periods could be obtained on the great majority of students, since class composition remains relatively stable during these weeks.

Testing Schedule

Originally, the peer ratings and the questionnaire were administered at three different times. The first testing was just prior to the first examination, the second testing just after the second written examination, and the final testing just after the fourth written examination. The second testing was eventually dropped as being superfluous. Therefore, the experimental classes were tested only before the first and after the fourth written examination.

Overall Experimental Plan

Although the same general plans were followed in both experimental classes, a number of the details were handled differently. The changes made in handling the second experimental class were attempts to correct what were seen

as problems or errors in handling the first class. The following analysis of procedures presents the essentials and emphasizes the differences in the handling of the two classes:

Item	Experimental Class 1	Experimental Class 2
Instructor Briefing	Instructor personnel were given complete background briefing and oriented to their role. Briefing was given about three weeks before the class starting date.	Same as first class.
Student Briefing	On the third day of class a 15-minute briefing was given to the students. They were given competition group assignments, given the terms of the competition, told of the rewards, and given a brief explanation of the purpose. The main purpose, as related to the students, was to provide conveniently sized study groups.	Essentially the same as the first class, but a much more detailed presentation on purpose. The equality of the groupings was emphasized, and the need for tutoring was brought out. Students were encouraged to ask questions within their groups, and told of their obligation to aid one another.
Test Administration	The first testing was just prior to the first class examination, and the second testing was just after the fourth written examination.	Same as first class.
Laboratory Assignments	Students were permitted to choose their own partners, although instructors had the option of rearranging partnerships if they felt it would be to the class's advantage.	Laboratory partnerships were formed within competition groups. Each group had its own workbench, to some extent isolating each group physically from the others.
Incentives	Groups were rewarded after each competition period. HumRRO personnel handled all incentives.	Incentives were the same except that instructor personnel (normally the chief instructor) handled incentives whenever possible.

The change in the student briefing was designed to make the stated purpose seem more plausible. The change in laboratory assignment procedures was made in the hope of building up greater group identification. Having the instructors handle the entire incentive program was done to create the impression that the competition was basically an Army, rather than a HumRRO, project. Subjectively, these changes seemed to make a difference in the overall class attitude toward the experiment. The first class seemed to feel that the competition experiment was a separate affair run by HumRRO that merely paralleled their training. This was attested to when students came to the HumRRO office in hopes of getting theater tickets a day early for a particular movie. In the second class, all questions and requests were directed to the school's instructional staff. It seemed, too, that the instructional staff became more personally involved and took a greater interest in the second class, because they handled most of the details.

RESULTS AND DISCUSSION

Validation of Assessment Devices

It was hoped that the peer rating of "Desire to Succeed in Training" and the questionnaire data would provide the means of assessing student motivation that was needed to answer several of the questions posed in this research. Validity data on these two measures, along with the "Ability" rating and two ACB scores for the pre-experimental classes are presented in Table 3. The signs of the correlations involving the questionnaire have been reversed, in effect reversing the direction of scoring of the questionnaire, so that all correlations in the table would follow the same pattern in showing relationship—that is, higher motivation and higher aptitude associated with higher achievement.

The classes represented in this table were those employed in developing the questionnaire and peer ratings used for the experimental classes. Since the peer ratings were administered in the same manner, the scores in all classes are comparable. However, only the fourth class received the questionnaire in the final form, so, the correlations for the questionnaire are not strictly comparable. As a final check on the questionnaire, one additional class was administered the questionnaire in its final form, and the obtained validity with ME average was .49.

It can be noted that the correlation of GT with final ME average is considerably higher than the correlation between EL and ME average in all but the first

Table 3

Validity Coefficients for Various Predictors of Final ME Average[a, b]

Pre-experimental Class	N	EL	GT	Ability Rating	Desire Rating	Questionnaire
A	23	.52**	.53**	.56**	.60**	.49**
B	25	.50**	.81**	.80**	.71**	.56**
C	24	.47**	.82**	.69**	.51**	.43*
D	37	.47**	.62**	.76**	.47**	.60**[c]

[a] ME, Missile Electronics subcourse; EL, Electronics aptitude area scores; GT, General Technical aptitude area scores.

[b] * indicates $p < .05$, and ** indicates $p < .01$, employing a one-tailed test.

[c] N = 36.

class. This is undoubtedly due, at least in part, to the fact that the EL score is much more restricted in range, since these men were selected for training on the basis of EL scores. All men had EL scores of 100 or higher, while GT scores ranged down to 71, with a considerable proportion being under 100. This finding led to the conclusion that GT should be used as a control for aptitude in this research since the students were relatively homogeneous with respect to the EL score, which is the official prerequisite for the course.

Table 4

Partial Correlations of Motivation Measures With Final ME Average, Holding GT Constant[a]

Pre-experimental Class	N	Measure	
		Desire Rating	Questionnaire
A	23	.47*	.42*
B	25	.62**	.35*
C	24	.14	.35*
D	37	.49**	.63**[b]

[a] * indicates $p < .05$, and ** indicates $p < .01$, employing a one-tailed test.
[b] N = 36.

Partial correlations of the motivation measures with final ME average with GT held constant are shown in Table 4. In other words, these are the correlations that would be expected between the motivation measures and ME average if everyone in the class had the same GT score. All but one of the correlations is significant at the .05 level, employing a one-tailed test. Therefore, it must be concluded that motivation, as measured by the peer rating of "Desire" and the questionnaire, is a significant factor in success in ME.

Overall comparisons of the predictors with the two different types of examinations that enter into final ME average are presented in Tables 5 and 6. The written examinations are objectively scored multiple-choice exams, while the practical examinations given in the laboratory have a considerable element of subjectivity in their scoring. The reliability of the written exams is considerably higher. Based on odd-numbered tests versus even-numbered tests, the estimated reliability of the written exams is about .90 while the estimated reliability of the practical is about .60. Obtained reliability, of course, varied from class to class.

Table 5

Validity Coefficients for Various Predictors of ME Written Examination Average[a]

Class	N	GT	Ability Rating	Desire Rating	Questionnaire
A	23	.57**	.60**	.65**	.53**
B	25	.81**	.79**	.73**	.61**
C	24	.76**	.46*	.36*	.22
D	37	.59**	.70**	.53**	.64**[b]

[a] * indicates $p < .05$, and ** indicates $p < .01$, employing a one-tailed test.
[b] N = 36.

Table 6

Validity Coefficients for Various Predictors of ME Practical Examination Average[a]

Class	N	GT	Ability Rating	Desire Rating	Questionnaire
A	23	.22	.26	.30	.32
B	25	.55**	.67**	.59**	.42*
C	24	.62**	.56**	.47**	.63**
D	37	.51**	.73**	.47**	.53**[b]

[a] * indicates $p < .05$, and ** indicates $p < .01$, employing a one-tailed test.
[b] N = 36.

In general, all of the predictors have higher correlations with the written exam average than with the practical exam average.

This, of course, would be expected from the reliability data. However, there is a slight tendency for the motivation measures to be more consistent than GT with respect to the two types of examinations. For example, GT has higher correlations with written exam average than does the questionnaire in three of the four classes, while the questionnaire is more highly correlated with practical exam average in three of the four classes. This might have been expected. Lecture material is presented in a highly academic manner, and a high degree of verbal and numerical skills would be expected to be involved in the learning process. However, the requirements for these skills are probably much lower in the laboratory. The persistent and diligent worker with minimal aptitudes is likely to do well in the practical exams. Hence, motivation might be expected to be of greater relative importance than aptitude in the laboratory. These observations led to the conclusion that these two types of exams should be treated separately, at least for the time being.

Sociograms were constructed for three of the four classes tested during the development of the peer ratings and questionnaire. One sociogram was constructed from the "Friendship" ratings obtained prior to any tests, and one was constructed from the ratings obtained following the fourth written examination. One example of a sociogram is shown as Figure 2. The numbers along the left and across the top indicate each man's alphabetical position within the class. The sequence has been rearranged so that small groups of mutual friends, or cliques, appear together. Reading across the page are the choices made by an individual, and reading down the page are the nominations received by the individual.

The keys for the choices, as given in the figure, may be interpreted as follows:

(1) ■ indicates mutual "Most" nominations. Man number 12 gave man 29 a "Most" nomination and man 29 gave man 12 a "Most" nomination.

(2) ⊟ indicates individual positive choices. Man number 6 gave a "Most" nomination to man 12, but man 12 gave neither a "Most" nor a "Least" to man 6.

(3) ▬ shows mutual "Least" nominations. Man number 15 gave a "Least" nomination to man 30 and also received a "Least" from him.

(4) ═ shows individual "Least" choices. Man number 19 gave a "Least" nomination to man 27, but he received neither a "Least" nor a "Most" from man 27.

Using the keys, Figure 2 shows that man number 29 gave "Most" nominations to men 12, 3, 19, 30, and 23; he gave "Least" nominations to men 15, 10, 1, 28, 26, and 24. He received "Most" nominations from men 12, 3, 19, 30, 20, and 2; and he received "Least" nominations from men 1, 5, 21, 8, and 24.

The key for opposite choices is also shown:

(1) ⊟ and ═ show opposite choices. For example, man number 3 gave a "Most" nomination to man 11, but man 11 gave man 3 a "Least" nomination.

The small friendship groups, or cliques, are relatively well formed. That is, the composition of the groups is relatively easy to determine, although there seems to be some overlap between the fringe members of the two large cliques in the upper left-hand corner. However, no meaningful relationships could be found between these small social groupings and factors related to success in training. On the first rating, cliques tended to be composed of men who had taken BCT at the same Center. However, even this relationship tended to disappear on the fourth week sociogram. Also, there was a tendency for NCOs to form a separate clique within a class. This was expected, since the NCOs are generally older, many are married and living off post, and they are separated from the typical student by rank and privilege.

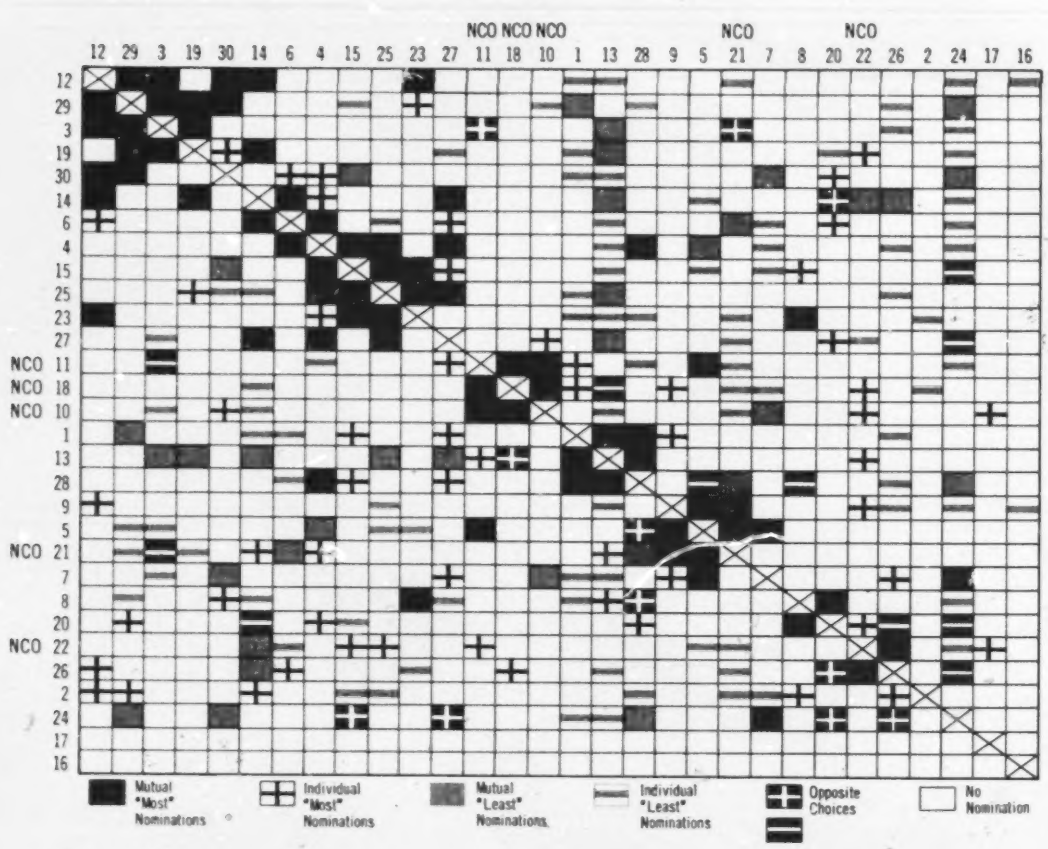
Sociogram
NCO NCO NCO NCO NCO
12 29 3 19 30 14 6 4 15 25 23 27 11 18 10 1 13 28 9 5 21 7 8 20 22 26 2 24 17 16
12 29 3 19 30 14 6 4 15 25 23 27 NCO 11 NCO 18 NCO 10 1 13 28 9 5 NCO 21 7 8 20 NCO 22 26 2 24 17 16
Mutual "Most" Nominations
Individual "Most" Nominations
Mutual "Least" Nominations
Individual "Least" Nominations
Opposite Choices
No Nomination

Figure 2

Men within cliques varied considerably with respect to aptitude scores, "Desire" scores, and questionnaire scores. There were no "good" cliques or "bad" cliques. In general, the largest clique (upper left-hand corner of Figure 2) was composed of somewhat superior men, but membership in the clique was not highly predictive of success. The clique composed of the men numbered 1, 13, and 28 was probably the most successful clique. Number 13, who was widely disliked (as can be seen from the sociogram), finished ME with an average over 99. He was highly rated in "Ability" and "Desire," however.

Similarly, findings from a study of the two other classes for which sociograms were made also failed to show any promising relationships between social structure and the school performance or motivation of the students.

Results in Experimental Classes

Validity of Predictors

The validities of the predictors obtained in the two experimental classes are shown in Table 7. In general, these validities are very similar to those obtained in previously tested classes, although the validities of the "Desire" rating tend to represent the highest of the coefficients obtained with that measure. The contrast between GT and the questionnaire is even more striking than in the

Table 7

Validity Coefficients for Various Predictors [a]

ME Averages	Experimental Class 1 ($N = 25$)				Experimental Class 2 ($N = 36$)			
	GT	Ability Rating	Desire Rating	Question-naire	GT	Ability Rating	Desire Rating	Question-naire
Final ME	.67**	.81**	.74**	.74**	.63**[b]	.57**	.35*	.50**
ME Written Test	.70**	.82**	.78**	.54**	.69**	.62**	.41*	.48**
ME Practical Test	.52**	.68**	.56**	.62**	.45**	.49**	.29	.45**

[a] * indicates $p < .05$, and ** indicates $p < .01$, employing a one-tailed test.

[b] $N = 35$.

non-experimental classes. GT had considerably lower validities for the practical exams than for the written exams, while the validities for the questionnaire were roughly equal for both types. This finding essentially confirms the proposition that the relative importance of aptitude and motivation varies with the type of examination given.

Effect of Competition on Performance

It was hypothesized that group competition would improve performanee, and that the greatest improvement would be evidenced by the weaker students. Since only two classes received the experimental treatment, it was not possible to fully test this hypothesis. Nevertheless, it was felt that the experimental classes should be compared to classes that had not received the experimental treatment. The control group selected was comprised of the nine classes in MOS 22J that had initiated training between the starting dates of the two experimental classes.

Both the experimental and the control classes were split approximately into thirds on the basis of the combined GT distribution, and the upper and lower groups were selected for comparison. The mean final ME scores for each of the groups are shown in Table 8. As can be seen, the mean scores of the two higher aptitude groups are virtually identical, while the mean of the lower aptitude experimental group is some six points higher than that of the controls.

Table 8

Mean Final ME Scores for Men in the Upper and Lower Thirds of the GT Distribution in the Experimental and Control Classes

GT Distribution	Experimental ($N = 20$)	Control ($N = 75$)
Lower third (GT ≤ 107)	75.4	69.2
Upper third (GT ≥ 120)	90.8	90.5

A comparison was made of the number of lower aptitude students in the two groups who had ME averages of less than 70. Six of the 20 experimental students (30%) did not achieve a 70 average, in comparison with 39 of the 75 control students (52%). Although this difference was statistically significant at the .05 level, there were not sufficient data to obtain an accurate estimate of the attrition level that would be expected if the experimental technique was routinely used by a school.

Relationships Between Success and Group Identification

It was hoped that members would identify with their competition group, and enter wholeheartedly into the spirit of competition. A means of determining how closely a man identified with other members of his competition group lay in the peer ratings. It was felt that any strong feelings toward other members, either positive or negative, represented a type of identification. Hence, either "Most" or "Least" nominations for other group members were accepted as indications of identification.

The within-group nominations of the experimental classes are shown in Table 9. Nominations on all five peer ratings were counted. In general, the number of within-group nominations increased on the second testing, indicating a higher degree of within-group feeling after four weeks in class.

However, the feelings were not all positive. Table 10 shows changes in nominations between first and second testings on "Ability" and "Desire" ratings, which were chosen for this comparison because they should reflect the amount

Table 9

Within-Group Nominations in the Experimental Classes

Group	Experimental Class 1			Experimental Class 2		
	1st Test	2d Test	Difference	1st Test	2d Test	Difference
I	59	64	+5	95	132	+37
II	66	50	−16	64	71	+7
III	28	53	+25	63	72	+9
IV	51	76	+25	82	96	+14
Total	204	243	+39	304	371	+67

Table 10

Within-Group Ratings of Ability and Desire in the Experimental Classes

Group Vote	Experimental Class 1					Experimental Class 2				
	Competition Results		1st Test	2d Test	Net Difference	Competition Results[a]		1st Test	2d Test	Net Difference
	Wins	Losses				Wins	Losses			
I	0	4			−13	2	1			+13
Positive			19	14				27	42	
Negative			5	13				10	12	
II	2	2			−8	1	2			−3
Positive			17	9				16	14	
Negative			10	10				9	10	
III	2	2			+4	0	3			−14
Positive			7	15				17	9	
Negative			4	8				7	13	
IV	4	0			+6	3	0			+8
Positive			11	18				16	21	
Negative			11	12				15	12	
Total					−11					+4

[a]Each group had one tie.

of confidence the men have in others in their own group. In both classes, the group that lost most consistently shows the greatest negative change, while the group that won most consistently shows the greatest positive change in one class and the second most in the other class.[1] Although the amount of change is actually very small, the total negative change of 11 nominations for Experimental Class 1 seems indicative of a general loss of confidence of group members in their groups. The slight positive change shown for Experimental Class 2 would indicate little change between the two testings in the second experimental class.

Table 11 presents data on positive nominations for the "Friendship" rating for each class for both test administrations. The "Expected Number" represents the number of men that would be expected to nominate 0, 1, and 2 or more men in their own competition group if all nominations were made randomly.[2] The "Observed Number" is the actual number of men who nominated the indicated number of men in their own competition group. The total number of within-group positive nominations exceeded expectancy for all four test administrations, but the difference was statistically significant only in Experimental Class 2. At least in the second class, it appears that the artificial groupings did have an effect on personal friendship formation, and that men did tend to identify with their group.

Table 11

Distribution of Within-Group Friendship Nominations in the Experimental Classes

Experimental Class	1st Test			2d Test		
	0	1	2 or More	0	1	2 or More
1						
Expected Number	7.0	11.0	6.1	6.1	10.9	7.0
Observed Number	4	11	9	4	12	8
	($\chi^2 = 2.73$, not significant)			($\chi^2 = 0.99$, not significant)		
2						
Expected Number	9.5	14.5	9.0	9.0	13.7	8.3
Observed Number	6	9	18	4	10	17
	($\chi^2 = 12.34$, $p < .01$)			($\chi^2 = 12.97$, $p < .01$)		

The same tendency observed in the control classes for men from the same BCT Center to form into cliques was noted. There was also some tendency for cliques to reflect the competition groups, as might have been suspected from the "Friendship" vote reported in Table 11. However, there seemed to be no additional useful information. No relationship between social structure, GT score, motivation scores, or course grades was observed. This, of course, was consistent with the findings in previous classes.

Differences Between Experimental Classes

Differences in the treatment of the two experimental classes have already been discussed to some extent. It is impossible to determine exactly what effect these differences had on the classes, but the classes varied in several respects, suggesting that differences in treatment may have been important.

[1]For the second experimental class, wins and losses are shown for only three periods because in one period both sets of competing groups tied in the number of tests failed. Since academic averages of the tieing groups were within one point of one another, all groups were declared winners and all men received the rewards for that period. Hence, Group IV in one sense actually won all four competitions, and Group III won once.

[2]Although the total number of men in competition groups in Experimental Class 1 did not change between the two test administrations, the total number of men in the class did change because of transfers in and out of the class. Since every man's name appeared on the peer rating forms, nominations for men not in groups had to be taken into account in computing the expectancies. Therefore, the expected values differ for Experimental Class 1 despite the fact that the number of men in competition groups did not change.

Table 12

Comparison of Predicted and Obtained Scores in the Experimental Classes

Average Score	Obtained	Predicted	Difference	t Value
Experimental Class 1				
Final	81.1	84.9	−3.8	NS
Written	85.4	85.0	+0.4	NS
Practical	73.0	83.9	−11.0	4.40 $p<.01$
Experimental Class 2				
Final	85.7	82.8	+2.9	NS
Written	80.9	82.3	−1.4	NS
Practical	91.2	81.5	+9.7	4.61 $p<.01$

For example, the difference between practical exam averages of the two classes is quite striking. Course grade data are presented in Table 12. Predicted scores for each man in each class for each type of exam were computed from prediction equations based on GT (the equations were based on data from the nine classes in MOS 22J that initiated training in the interval between the two experimental classes).

Both experimental classes performed about as expected on the written exams. However, Experimental Class 1 performance was significantly lower on the practical exams than was predicted, while the second class performed significantly higher than predicted. This result is interesting if the earlier speculation concerning the relationship of motivation and practical exam scores is valid. That is, if practical exam scores actually reflect motivation better than written exam scores, it would indicate that the second class had considerably higher motivation than the first class.

Scores from the questionnaire certainly indicate that this is true. Mean scores on the questionnaire are shown in Table 13. Scores for the first class are significantly higher (indicating poorer motivation) than for the second class for both test administrations. Since the questionnaire scores are believed to be valid reflections of motivation, it seems that the second class had higher motivation both at the beginning and at the end of four weeks of training.

Table 13

Mean Questionnaire Scores in the Experimental Classes

Test Period	Experimental Class 1	Experimental Class 2	Difference	Significance
1st	29.4 ($N=25$)	25.2 ($N=36$)	4.2	$t=2.03$ $p<.05$
2d	29.2 ($N=23$)	23.8 ($N=33$)	5.4	$t=4.61$ $p<.01$

Furthermore, there is good evidence that these differences are not merely reflections of higher aptitude, and hence, higher motivation for the subject. Aptitude scores for the two classes are shown in Table 14. Although Experimental Class 1 had higher means on both aptitude measures, neither of the differences in means is significant. Therefore, a real difference in motivation seems to be the only plausible explanation for the differences in questionnaire scores between the two classes.

Table 14

Mean Aptitude Scores in the Experimental Classes

Aptitude Area	Experimental Class 1 ($N=26$)	Experimental Class 2 ($N=35$)	Difference
GT	116.1	111.7	4.4
EL	118.4	117.5	0.9

There is some slight evidence that differences in motivation between the classes became even more pronounced with time. Mean questionnaire scores

for those men who were present at both administrations of the questionnaire are presented in Table 15. The first class had a slightly worse score on the second administration, while the second class had a slightly better score. (As discussed earlier, the scoring method used considers lower scores indicative of higher motivation.) For neither is the difference between the means of the two administrations significant. However, the difference between the differences approaches significance ($t = 1.84$, $p < .10$). Although not conclusive, this suggests that time may have had a differential effect on the motivation of the two classes.

Table 15

Mean Questionnaire Scores for Men Present at Both Test Administrations

Comparison	1st Test	2d Test	Difference	Significance
Experimental Class 1 ($N = 23$)	28.4	29.2	.8	NS
Experimental Class 2 ($N = 30$)	24.6	24.0	−0.6	NS
Difference Between Classes			1.4	$t = 1.84$ $p < .10$

The motivation of the two classes apparently differed at the beginning of training, as indicated by the significant difference between the original means of the questionnaire scores (see Table 13). Motivation also tended to decrease in the first class while it increased in the second class (see Table 15). These data, coupled with the data on changes in "Friendship" choices (see Table 11), suggest a relatively greater motivation problem in Experimental Class 1. Certainly if practical exam grades reflect motivation as hypothesized earlier, the two classes appear to be quite different. Because these differences were evident at the end of the first week, it is difficult to attribute them to the variation in treatment of the two classes. However, there is one difference between the classes that could conceivably account for the differences in motivation. The second class contained three NCOs. All three were apparently well motivated, and the senior NCO served as the class leader. The first class had no NCOs and a poorly motivated private for a class leader. The effect of leadership on class motivation is an unknown, but there is little else to account for the differences between the classes.

Factors Related to Motivation

Several questions which this research was designed to answer were listed in the discussion of objectives. Data relevant to some of these have already been discussed. However, for purposes of clarity, each question will be listed and relevant data will be mentioned again.

(1) How does motivation change during the course of training in experimental classes compared with regular classes?

Changes in motivation were assessed by comparing changes in questionnaire scores between the first and second administrations. When the mean change in the experimental classes was compared with the mean change in the control classes, a t of 0.45 was obtained. Although the changes in scores were in the anticipated direction, that is, the experimentals maintained their motivation better than the controls, the t value does not approach significance. Therefore, it must be concluded that the addition of group competition alone did not aid significantly in maintaining class motivation.

(2) How does success or failure affect motivation?

It was assumed that early success or early failure in training might have an effect on the attitude of the affected students. For analysis on this point, students in both experimental and control classes were divided into three groups. The failure group consisted of all students who failed two exams or more during the first four weeks, or failed one exam and had a current average of 75 or lower. A success group was made up of students who had never failed an exam and had an average of 85 or higher. The remainder of the students formed the third group. The success group and failure group were compared with respect to changes in questionnaire score from first to second administrations. It was predicted that the success group would have a more favorable change in motivation than the failure group. A t value of 1.52, $p < .10$ for a one-tailed test, was obtained in this comparison. Although this is not an acceptable level of significance, it is nevertheless suggestive. Assuming that additional data would confirm the hypothesis, the results suggest that easier exams might be called for very early in the training, because students who are successful early in training appear to maintain their motivation somewhat better than students who fail. Perhaps those students who experience success gain confidence, and are more willing to put forth the effort that is required in later stages of training.

(3) Is there any relationship between motivation and the formation of personal friendships?

Careful study of the data from the "Friendship" rating in several classes failed to show any effects related to motivation. Mutual friendship choices occurred as frequently between a highly motivated and a poorly motivated individual as they did between individuals of like motivation. In the control classes no relationship between friendship choices and any other known factor was observed. Apparently, choices were based on characteristics not studied in this research.

(4) Does group competition affect the formation of personal friendships?

Data already presented indicate an affirmative answer. In both of the experimental classes, the proportion of within-group friendship choices exceeded chance. Since groups were formed solely on the basis of aptitude variables, with aptitude being equally distributed between the groups, no other explanation for the high frequency of within-group choices seems plausible. Because the grouping did tend to force some familiarity, especially in the second experimental class where laboratory assignments were made by group, the opportunity for friendships to emerge within groups was probably increased.

(5) How important is motivation relative to aptitude in determining success in training?

Table 16

Predictive Validities (Correlations) of GT and the Questionnaire in the Combined Experimental Classes

Averages	GT	Questionnaire
Final ME	.61	.63
Written	.70	.52
Practical	.31	.58

When students have been preselected for training based on aptitude, the data presented so far suggest that motivation is of greater relative importance to success in the laboratory, while aptitude is of greater relative importance in the classroom. The data in Table 16, based on a combination of the two experimental classes, illustrate this. It appears from the table that both are equally important in overall success as indicated by the correlations with final ME average.

However, data from previous classes have generally shown that GT is a somewhat better predictor of final average than the questionnaire. In any event, both have been shown to be of too great a significance for either to be neglected.

Implications of This Research

Because only two classes received the experimental treatment, little can be said about the usefulness of group competition as a dependable means of improving class motivation. Moreover, the results obtained indicate that group competition by itself may not be uniformly effective in improving motivation. On the whole, results obtained in improving performance of lower aptitude students through the use of group competition were encouraging. Differences between the experimental classes in both composition and experimental treatment make the results difficult to interpret.

The questionnaire data available from all of the classes (experimental and non-experimental) tested suggest that variation in individuals' motivation for training can be assessed with a relatively short questionnaire. Peer ratings also can be used, but unfortunately, the "forced choice" technique required to obtain the ratings makes it impossible to compare one group to another. Either method works reasonably well in determining the rank order within a given group.

The questionnaire may have several possible uses outside of evaluating means of improving motivation. For example, if it were administered routinely to students, those students who are likely to be problems might be identified early in the course. Actually, the questionnaire could have been very useful for this purpose in the classes tested. Data from the last four classes, including the experimental classes, were examined to test this possiblity. A cutting score of 35 was chosen, which selected the 15% with the poorest scores from the combined classes. Men who were predicted to fail on the basis of GT scores were eliminated, as were men who were predicted to have final ME scores of 85 or higher. The remaining group of ten men were those who indicated a motivation problem on their questionnaires, and whose GT scores were such that they might have difficulty in passing without some sustained effort. Five of these ten men actually did fail. Since the overall attrition rate in these classes was only 12 percent, the questionnaire appears to be quite an effective means of locating problem students.

Problem classes might also be identified if generally poor scores are obtained. In some instances, it might even be possible to correct the problem. At least, some serious attempts to identify the problem could be made.

Numerous findings suggest possible avenues for additional research in this area. The effect of the rank and general attitude of the class leader has never been investigated. It was hypothesized earlier that differences in the class leaders might have been a factor in the differences observed in the motivation of the two experimental classes. This factor, and the effects of having higher and lower proportions of NCOs in a class seem worthy of study.

Further study of the motivating effects of success and failure seems warranted. Reinforcement during early trials has always been considered critical in learning studies, and may well be so in Army Service Schools. The effects of making exams more difficult or less difficult during the first weeks of training could be studied easily. It is hypothesized that classes given the easier exams will be more highly motivated and perform better during the

latter part of the training. The same effect might be accomplished by providing more intensive training or by extending the time in which early material is covered, if altering examinations is not desirable.

The possibility of forming competition groups based partly on data from the peer ratings should be considered. Compatibility could be built into the original groups and gross incompatibility of members could be avoided as much as possible. Such groups might prove to be more cohesive and cooperative than groups chosen simply on the basis of aptitudes. Consideration should also be given to using sociometric data in the selection of assistants for the class leader. Popular, rather than arbitrarily chosen, assistants might result in better morale and discipline.

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AND
APPENDICES

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Appendix A

SAMPLE NEWSPAPER ARTICLE

Participates in Army Study

_____ of _____

is a member of a group that has been cited for academic achievement at the U.S. Army Air Defense School, Fort Bliss, Texas. _____, son of _____, _____, is a member of a group of trainees undergoing electronics training in air defense artillery.

In conjunction with their specialized training, these men are participating in a study being conducted by the Human Resources Research Office (HumRRO). The class is divided into four groups, each composed of men whose aptitudes and past experience are closely balanced. Men within a group have been assigned the job of assisting any man in their group who is having difficulty with some portion of the material.

Every two weeks the four groups are paired and compete with each other. The group in each pairing that excels in academic performance is declared the winner. Members of the two winning groups are presented such token awards as theater passes or tickets to local bowling lanes.

_____ group has yet to be beaten in this academic competition.

Hometown Newspaper:

Name of Paper _____

City _____ State _____

Appendix B

SAMPLE LETTER TO PARENTS

DEPARTMENT OF THE ARMY
U.S. ARMY AIR DEFENSE HUMAN RESEARCH UNIT
U.S. CONTINENTAL ARMY COMMAND
FORT BLISS, TEXAS 79916

IN REPLY REFER TO ATHRD

8 September 1966

Mr. and Mrs. John Doe
1006 Main Street
Middletown, U.S.A.

Dear Mr. and Mrs. Doe:

This letter comes to you from the Air Defense Human Research Unit, to inform you of the outstanding achievement of your son, PVT John Doe, Jr., and the members of his group in the classroom portion of his training in Missile Electronics at the Air Defense School here at Fort Bliss.

We are investigating the effects of dividing the men into small groups within a class. The men who understand some portion of the material covered in a class are supposed to aid those in their group having difficulty. To add interest, the groups are paired and compete with each other on a bi-weekly basis. The group having the fewest exam failures wins the competition.

The group in which your son was a member was a winner in each competition period, and was awarded passes to local theaters. A record of four wins in four tries is a real credit to your son and his group.

Sincerely,

ALEXANDER D. BELL
Major, Artillery
Chief

Appendix C

PEER RATING FORMS

Familiarity Rating

Before beginning, draw a line through your name and across the page. In the column marked MOST, place a check mark (✓) by the names of the _____ men with whom you are most familiar, that is, whom you know best. In the column marked LEAST, place a check mark (✓) by the names of the _____ men whom you know least well.

NAME	MOST	LEAST
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
33.		
34.		
35.		
36.		
37.		
38.		
39.		
40.		

Friendship Rating

Before beginning, draw a line through your name and across the page. In the column marked MOST, place a check mark (✓) by the names of the _____ men whom you would most like to have as close friends. In the column marked LEAST, place a check mark (✓) by the names of the _____ men whom you would least like to have as close friends.

NAME	MOST	LEAST
1.		
2.		
3.		
4.		
5.		
6.		
36.		
37.		
38.		
39.		
40.		

Ability to Succeed in Training

Before beginning, draw a line through your name and across the page. In the column marked MOST, place a check mark (✓) by the names of the _____ men who you think have the most ability to succeed in an Army technical training course such as this one. In the column marked LEAST, place a check mark (✓) by the names of the _____ men who you think have the least ability to succeed in a technical training course. Do not place any check marks in the columns by your own name; but be sure to complete the item at the bottom of the page.

NAME	MOST	LEAST
1.		
2.		
3.		
4.		
5.		
6.		
36.		
37.		
38.		
39.		
40.		

How would you rate yourself with reference to other members of the class on ability to succeed in training?

_____ In the top quarter of the class _____ In the next to highest quarter

_____ In the next to lowest quarter _____ In the lowest quarter

Leadership Potential

Before beginning, draw a line through your name and across the page. In the column marked MOST, place a check mark (✓) by the names of the _____ men who you think have the greatest potential for being leaders either in or out of the Army. In the column marked LEAST, place a check mark (✓) by the names of the _____ men who you think have the least potential for becoming leaders. Do not rate yourself, but be sure to complete the item at the bottom of this page.

NAME	MOST	LEAST
1.		
2.		
3.		
4.		
5.		
39.		
40.		

How would you rate yourself with reference to other members of the class on leadership potential?

_____ In the top quarter of the class _____ In the next to highest quarter

_____ In the next to lowest quarter _____ In the lowest quarter

Desire to Succeed in Training

Before beginning, draw a line through your name and across the page. In the column marked MOST, place a check mark (✓) by the names of the _____ men who you think have the greatest desire to succeed in this course of training. In the column marked LEAST, place a check mark (✓) by the names of the _____ men who you think have the least desire to succeed in this course. Do not place any check marks in the columns by your own name, but be sure to complete the item at the bottom of the page.

NAME	MOST	LEAST
1.		
2.		
3.		
4.		
5.		
39.		
40.		

How would you rate yourself with reference to other members of the class on desire to succeed in training?

_____ In the top quarter of the class _____ In the next to highest quarter

_____ In the next to lowest quarter _____ In the lowest quarter

Appendix D

STUDENT ATTITUDE SURVEY

This short questionnaire is being given in an effort to find out how students feel about the Army and the job for which they are being trained. Please answer all items truthfully. Your answers will not be used for any purpose except to gain information on student attitudes. They will not affect your status in any way here at the Air Defense School.

If you have any questions, raise your hand and one of the monitors will come to you. If you have no questions now, write your name and the date at the top of the questionnaire and begin.

NAME_____

DATE_____

INSTRUCTIONS FOR ITEMS 1 - 11:

In each of the following items the beginning of a sentence will be presented along with five statements that could be used to complete the sentence. You are to choose the ending that best describes the way you feel, and mark an "X" in the blank in front of it.

1. My interest in electronics is:

   ____ 1. Very high; I am seriously considering making electronics my lifetime career.

   ____ 2. High; I enjoy learning electronics and may or may not choose it as a career.

   ____ 3. Moderate; About the same as most men my age.

   ____ 4. Low; I find electronics pretty dull and would not care for a career in the field.

   ____ 5. Very low; I have no interest in electronics and definitely will not make it my career.

2. I believe that failing this course would:

   ____ 1. Have a very bad effect on me the rest of my life.

   ____ 2. Have a bad effect on me, but not really hurt my future.

   ____ 3. Probably not have any very serious effect on me.

   ____ 4. Probably not affect my life at all.

   ____ 5. Probably work to my advantage rather than hurt me.

3. I expect to:

_____ 1. Succeed in this course without too much difficulty.

_____ 2. Succeed in this course, but it will not be easy.

_____ 3. Succeed, but it will be difficult for me and I may fail.

_____ 4. Probably fail, but I do have a chance to pass.

_____ 5. Fail, and feel that there is very little chance that I could pass.

4. If I were choosing my Army job again, I:

_____ 1. Would definitely choose the MOS for which I am now being trained.

_____ 2. Would very likely choose this MOS.

_____ 3. Would probably consider this MOS, but would consider a lot of different jobs, too.

_____ 4. Doubt if this MOS would be among my choices.

_____ 5. Would definitely not consider this MOS as a choice.

5. I really:

_____ 1. Want to succeed in this course no matter how hard I have to work to do so.

_____ 2. Want to succeed in this course, and will put out a reasonable amount of effort.

_____ 3. Would like to succeed in this course, but won't be too disappointed if I am relieved.

_____ 4. Wouldn't mind if I were relieved from this course.

_____ 5. Would like to be relieved from this course.

6. The statement which best describes my future career plans is:

_____ 1. I feel pretty sure that I will choose a career in the Army.

_____ 2. I seriously consider the Army, along with a few other career possibilities.

_____ 3. I have no definite career plans at all.

_____ 4. I don't think it likely that I will choose an Army career.

_____ 5. I won't choose a career in the Army.

7. With the kind of experience and background I have had, this course should be:

_____ 1. Very easy for me.

_____ 2. Relatively easy for me.

_____ 3. Neither real easy nor real difficult for me.

_____ 4. Kind of difficult for me.

_____ 5. Very difficult for me.

8. Throughout my future, I feel that the material I will learn in this course will:

_____ 1. Be extremely important in my life work, or as a hobby.

_____ 2. Be important in my life work, or hobby.

_____ 3. Be of some value to me in my life work or hobby.

_____ 4. Be of very little, if any, use to me in my life work or as a hobby.

_____ 5. Most likely not be of any use to me.

9. In my past experience, I:

_____ 1. Have greatly enjoyed going to school.

_____ 2. Usually enjoyed school.

_____ 3. Neither particularly liked nor disliked school.

_____ 4. Generally did not enjoy school.

_____ 5. Cared very little for going to school.

10. I feel that:

_____ 1. This training course will be of more future value to me than any other which I could have received in the Army.

_____ 2. This training course will be of future value, but there are many Army training courses which would have been just as good.

_____ 3. There are many Army training courses which would have been of more value to me in my future.

_____ 4. Almost any other training would have been more valuable.

_____ 5. There is probably no Army training which would be of much help to me in my future.

11. Have you ever built a radio or amplifier or other electronic equipment?

_____ 1. Yes, more than once.

_____ 2. Yes, once.

_____ 3. No, but I would enjoy doing so.

_____ 4. No.

12. Below you will find a list of jobs which are representative of the kinds of Army jobs. If you were coming into the Army, knowing what you know now, which of the jobs below would you consider? Put an "X" in one box in front of <u>each</u> job to show how you feel about that particular job.

Definitely Consider	Can't Decide	Would Not Consider	
☐	☐	☐	Light weapons infantryman
☐	☐	☐	Heavy field artillery crewman

Definitely Consider	Can't Decide	Would Not Consider	
☐	☐	☐	Ground-to-ground missile crewman
☐	☐	☐	Radar repairman
☐	☐	☐	Field radio repairman
☐	☐	☐	Electrical appliance repairman
☐	☐	☐	Aircraft armament repairman
☐	☐	☐	Welder-blacksmith-metal body repairman
☐	☐	☐	Dental or medical assistant
☐	☐	☐	Building trades worker
☐	☐	☐	Chemical warfare specialist
☐	☐	☐	Supply and warehouse specialist
☐	☐	☐	Wheel vehicle mechanic
☐	☐	☐	Driver (truck and auto)
☐	☐	☐	Aircraft mechanic
☐	☐	☐	Clerk-typist
☐	☐	☐	Draftsman
☐	☐	☐	Surveyor
☐	☐	☐	Printer
☐	☐	☐	Photographer
☐	☐	☐	Military policeman
☐	☐	☐	Communications center operator

13. Put an "X" in one box in front of each school subject, to show your interest in that subject while in high school or college.

High Interest	Low Interest	Did Not Take This Subject In School	
☐	☐	☐	English
☐	☐	☐	Math
☐	☐	☐	Foreign Languages
☐	☐	☐	Physics or Chemistry
☐	☐	☐	History
☐	☐	☐	Auto Mechanics Shop
☐	☐	☐	Music
☐	☐	☐	Electrical Shop

Questionnaire Scoring

For the first 11 items, the score given was the number of the alternative chosen for each item. In Item 12, "Radar Repairman" was the only job that figured in the final scoring. "Definitely Consider" was given a score of 1, "Can't Decide" was given a score of 2, and "Would Not Consider" was given a score of 3. In Item 13, only "Math," "Physics or Chemistry," and "Electrical Ship" were scored. On these courses "High Interest" was scored as 1, "Low Interest" was scored as 3, and "Did Not Take This Subject in School" was scored as 2.

In addition, a score was given for the self-rating of "Desire to Succeed in Training" from the peer ratings. The score given was the quarter of the class in which the student placed himself. As is obvious from the scoring, lower scores were considered as indicative of higher motivation.

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13. ABSTRACT

In a study to determine whether group competition is effective in improving motivation in technical training, two experimental classes were divided into four groups each, equal in size and mean aptitude. Each group competed with each of the other groups during successive two-week intervals. The winner in each pairing was the group that failed the smallest percentage of regularly scheduled school examinations during the period. Low-cost and recognition-type rewards were presented to members of winning groups. Peer ratings and an attitude questionnaire were administered before the first examination, and again after four weeks. The peer rating on desire to succeed and the questionnaire, both presumably measuring motivation, seemed to be valid predictors of success. Group competition did appear to be an effective means of improving academic performance of the lower aptitude men. The competition grouping was found to influence friendship choices on the peer ratings.

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Attitude Measurement						
Attrition in Training						
Group Competition						
Motivation						
Technical Training						

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1 CG US ARMY AD COMC ENT AFB ATTN ACGCB
2 CG 1ST ARMY FT GEORGE G MEADE
1 CG 3RD US ARMY FT MCPHERSON GA
1 CG FOURTH ARMY FT SAM HOUSTON ATTN G3
5 CG FIFTH ARMY FT SHERIDAN ATTN ALFGC TNG
1 CG ELSA ATTN AG-AC APC 96301 SAN FRAN
2 CG ELSA ATTN G-3 APC 96301 SAN FRAN
1 CLIN PSYCHOL SERV DEPT OF NEUROPSYCHIAT WALTER REED GEN HOSP
1 DIR MEL APG MD
2 ENGNR PSYCHOL LAB PIONEERING RES DIV ARMY NATICK LABS NATICK MASS
1 TECH LIB ARMY NATICK LABS NATICK MASS
3 CO ARMY CHEM R+D LABS ECBEMCCC ARSNL MC ATTN LIBN
1 REDSTONE SCIENTIFIC INFC CTR US ARMYMSL COMC ATTN CHF DOC SEC ALA
1 CO USAPA MBLTY DET TOBYHANNA ARMY DEPOT
1 CG ARMY ELEC PG FT HUACHUCA ATTN TECH LIB
12 CO 1ST AER DEP GUIDEC MSL BRGD TNG FT BLISS
1 SIXTH U S ARMY LIB DEPOT BLDG M 13 14 PRES OF SAN
1 PLANS OFFICER PSYCH HCQTRES USAGECECFORT ORD
5 CG FT ORD ATTN G3 TNG DIV
2 DIR WALTER REED ARMY INST OF RES WALTER REEC ARMY MED CTR
ATTN NEURCPSYCHIAT DIV
1 CO HQ ARMY ENLISTED EVAL CTR FT BENJ HARRISON
1 DPTY FOR BIOASTRONAUT PG AIR PG CTR EGLIN AFB
1 DIR FT ARMY ENGNR R+D LABS FT BELVOIR ATTN TECH DOCU CTR
1 CO FRANKFORD ARSNL ATTN SMUFA-N6400/202-4
1 CG 5TH RGN USARAGCOM FT SHERIDAN ATTN G3 TNG
3 6TH RGN USARADCOM FT BAKER
1 4TH ARMY MSL COMD AIR TRANSPORTABLE SAN FRAN
2 CO PICATINNY ARSNL DOVER N J ATTN SUMPA VCI
1 DEP SUPPLY AGY CAMERON STATION ATTN LIB
1 CO ARMY CBT DEVEL COMC FT BENJ HARRISON ATTN ADJ GEN AGY
1 REP M MS IS NASA ALA
1 CBT OPNS RES OF ARMY CBT DEVEL COMC FT BELVOIR
ATTN OPNS ANLS HUMAN FACTORS
1 CO ARMY CBT DEVEL COMC FT BENNING ATTN INF AGY
1 CO ARMY CBT DEVEL COMC FT KNOX ATTN ARMOR AGY
8 ARMY CBT DEVEL COMD FT BRAGG ATTN SPEC WARFARE AGY
1 EVAL DIV OAO ARMY SIG CTR + SCH FT MONMOUTH
1 CO US ARMY CDC AVN AGCY FT RUCKER
1 CHF CURRICULUM BR RESIDENT INSTR DEPT ARMY LOGISTICS MANGT CTR FT LEE
3 CIVLN PERS OPCR US ARMY SPT CTR ST LOUIS ATTN EMPLOYEE DEVEL OFCR
3 ARMY WAR COLL CARLISLE BKS ATTN LIB
1 ASST COMDT ARMY INTEL SCH FT HOLABIRD ATTN PLANS DIV OAO
1 COMDT COMD + GEN STAFF CO FT LEAVENWORTH ATTN ARCHIVES
1 DIR OF MILIT PSYCHOL + LDRSHP US MILIT ACAD WEST POINT
1 US MILIT ACAD WEST POINT ATTN LIB
1 COMDT ARMY AVN SCH FT RUCKER ATTN SCH LIB
2 COMDT ARMY SECUR AGY TNG CTR + SCH FT DEVENS ATTN LIB
1 COMDT ARMED FORCES INDSTR COLL FT LESLEY J MCNAIR
2 COMDT NATL WAR COLL FT LESLEY J MCNAIR ATTN CLASSF RECORDS BR LIB
1 MED FLD SERV SCH BROOKE ARMY MED CTR FT SAM HOUSTON ATTN STIMSON LIB
9 DIR OF INSTR ARMOR SCH FT KNOX
1 COMDT ARMY ARMOR SCH FT KNOX ATTN WEAPONS DEPT
1 COMDT ARMY CHAPLAIN SCH FT HAMILTON
1 COMDT ARMY CHEM CORPS SCH FT MCCLELLAN ATTN EDUC ADV
1 ARMY FINANCE SCH FT BENJ HARRISON
4 COMDT ARMY ADJ GEN SCH FT BENJ HARRISON ATTN EDUC ADV
1 ARMY INF SCH FT BENNING ATTN EDUC ADV
1 USA INF SCH ATTN DIR OF INSTR FT BENNING
1 ARMY GM SCH FT LEE ATTN LIB
1 COMDT ARMY GM SCH FT LEE ATTN EDUC ADV
1 COMDT ARMY TRANS SCH FT EUSTIS ATTN EDUC ADV
1 COMDT ARMY MILIT POLICE SCH FT GORDON ATTN DIR OF INSTR
2 COMDT US ARMY SOUTHEASTERN SIG SCH ATTN: EDUC ADVISOR FT GORDON
1 CG ARMY ORD CTR + SCH ABERDEEN PG ATTN AISO-SL
9 ASST COMDT ARMY AIR DEF SCH FT BLISS ATTN CLASSF TECH LIB
5 CG ARMY ARTY + MSL CTR FT SILL ATTN AVN OFFR
1 COMDT ARMED FORCES STAFF COLL NORFOLK
1 COMDT ARMY SIG SCH FT MONMOUTH ATTN EDUC COORD
1 COMDT JUDGE ADVOCATE GENERALS SCH U OF VA
1 EDUC CONSLT ARMY MILIT POLICE SCH FT GORDON
6 COMDT ARMY ENGNR SCH FT BELVOIR ATTN AIRRES-SY
2 COMDT US ARMY SCH EUROPE ATTN REF LIB APO 09172 NY
1 COMDT ARMY PREVY HEL SCH FT WOLTERS
1 DIR OF MILIT INSTR US MILIT ACAC WEST POINT
1 SPEC WARFARE SCH FT BRAGG ATTN LIB
4 USA SPEC WARFARE SCH ATTI COUNTERINSURGENCY DEPT FT BRAGG
1 ARMY SIG CTR + SCH FT MONMOUTH ATTN TNG LIT DIV OAO
1 COMDT US ARMY MGT SCH FT BELVOIR
2 SECY US ARMY MSL & MUNITIONS CTR & SCH REDSTONE ARSNL
2 COMDT WOMENS ARMY CORPS SCH + CTR FT MCCLELLAN
2 HQ ABERDEEN PG ATTN TECH LIB
1 COMDT US ARMY INTEL SCH FT HOLABIRD
1 COMDT ARMY GM SCH OPC DIR OF NONRESIC ACTVY FT LEE ATTN TNG MEDIA DIV
2 DIR BRGD + BN OPNS DEPT USAIS FT BENNING
1 LEADERSHIP COM CC OPS DEPT US ARMY INF SCH FT BENNING
1 DIR COMM ELEC USAIS FT BENNING
2 DIR COMPANY TACTICS CEPT USAIS FT BENNING
1 CG US ARMY SIGNAL CTR + SCH ATTN SIIGYL-3(COBET III
1 SECY OF ARMY
1 OCS-PERS DA ATTN CHF CAS DIV
1 DIR OF PERS STUDIES + RES OCCSPER DA ATTN BG WALLACE L CLEMENT
2 AGS FOR FORCE DEVEL DA ATTN CHF TNG DIV
1 CHF OF ENGNRS DA ATTN EAGTE-T
1 HQ ARMY MAT COMD R+D DRCTE ATTN AMCRD-RC
1 CHF OF PERS OPNS OPCR PERS DRCTE DA ATTN SIG BR
1 CLIN PSYCHOL CONSLT CPC OF CHF PSYCHIAT + NEUROL CONSLT OFC OF SURG GEN
ATTN LT COL PSC

2 CG ARMY MED R+D COMD ATTN BEHAV SCI RES BR
1 US ARMY BEHAVIORAL SCI RES LAB WASH. D.C. ATTN: CRD-AR
1 OPO PERS MGT DEV CPC ATTN MOS SEC (NEW EQUIP) OPOMO
1 ARMY PROVOST MARSHAL GEN
1 OPC RESERVE COMPCN CA
2 CHF ARMY SECUR AGY ARLINGTON HALL STA ATTN ACS-GI
50 ADMIN DOC ATTN: TCA (HEALY) CAMERON STA ALEX., VA. 22314
1 CO US ARMY MED RES LAB FT KNOX
1 CG ARMY ELECT COMD FT MONMOUTH ATTN AMSEL CR
1 CHF OF R+D DA ATTN CHF TECH + INCSTR LIAISON OFC
2 CG ARMY MED R+D COMC ATTN MEDCH-SR
1 U S ARMY BEHAVIORAL SCI RES LAB WASH. D.C. ATTN CRD-AIC
1 COMDT ARMY CBT SURVEIL SCH FT HUACHUCA ATTN ATSUR S3
1 CG ARMY AIR DEF COMD ENT AFB
2 TNG + DEVEL DIV CDCS-PERS
1 CC US ARMY MAT COMD WASH D.C. ATTN: AMCPT-CM ROBT DETIENNE
1 PRES ARMY ARMOR BD FT KNOX
1 PRES ARMY INF BD FT BENNING ATTN FE+SP DIV
2 PRES ARMY AIR DEF BD FT BLISS ATTN MST DIV
1 PRES ARMY MAINT BD FT KNOX
2 PRES ARMY AVN TEST BD FT RUCKER
2 PRES ARMY ANTY BD FT SILL
1 ARMY ABN ELEC + SPEC WARFARE BD FORT BRAGG ATTN LIB
1 DPTY PRES ARMY MAT COMD BD ABERDEEN PG
1 US ARMY ARCTIC TEST CTR A L C OFFICE SEATTLE
3 CG 4TH ARMORED DIV APC 09326 NY
1 CO 3D ARMORED CAV REGT APO 09034 NY
1 CO 14TH ARMORED CAV REGT APO 09026 NY
2 CG ARMY ARMOR + ARTY FIRING CTR FT STEWART ATTN ACS-G3 TNG OFCR
1 1ST ARMORED DIV HQ+HQ CC FT HOOD ATTN ACS-G2
5 1ST INF DIV 1ST PED TANK BN 63D ARMOR FT RILEY
2 3D INF DIV 1ST BN 64TH ARMOR APO 09036 NY
8 8TH INF DIV 2D BN 68TH ARMOR APO 09034 NY
1 CC COMPANY A 3D BN 32C ARMOR 3D ARMORED DIV (SPEARHEAD) APO 09039 NY
1 CO 5TH BN 33D ARMOR FT KNOX
1 CO 3D MED TANK BN 68TH ARMOR ATTN S3APO 09028 NY
1 CC 3D MED TANK BN 37TH ARMOR APO 09066 NY
6 CO 2D BN 34TH ARMOR FT IRWIN
2 CALIF NG 40TH ARMORED DIV LOS ANGELES ATTN AC OF SG3
1 55TH COMD HQ DIV ARMY NG JACKSONVILLE FLA
1 CG HQ 27TH ARMORED DIV NY AIR NG SYRACUSE
1 TEXAS NG 49TH ARMORED DIV DALLAS
1 CG ARMY ARMOR CTR FT KNOX ATTN G3 AIBKGT
2 CG 1ST INF DIV FT RILEY ATTN G3
1 CG 3RD INF DIV ATTN G3 NY
3 CG 4TH INF DIV FT LEWIS ATTN G3
1 CG 7TH INF DIV SAN FRAN ATTN G2
1 CG 8TH INF DIV ATTN G2 APO 09111 NY
1 CG 5TH INF DIV (MECH) FT CARSON
5 CG 24TH INF DIV ATTN G3 APO 09112 NY
3 CG 82D ABN INF DIV FT BRAGG ATTN G3
1 CO 197TH INF BRGD FT BENNING ATTN S3
1 CO 1ST BN (REINF) 3D INF (THE OLD GUARD) FT MYER
1 CC HQ 2D BN 6TH INF REGT APO 09742 NY
7 CO 3D BN 6TH INF REGT APO 09742 NY
1 CO 171ST INF BRGD APC 98731 NY
3 CG 25TH INF DIV APO 96225 NY
1 CO 4TH BG 30TH INF FT SILL
1 CO 3D BN 39TH INF APC 09029 NY
1 CO 1ST BN 39TH INF APO 09034 NY
1 CO 2ND BN 15TH INF NY ATTN S 3
5 CC 1ST BN (MECH) 52D INF 1ST ARMORED DIV (OLD IRONSIDES) FT HOOD
7 4TH BN (MECH) 54TH INF FT KNOX
1 CG ARMY PARTIC GP NAV TNG DEVICE CTR PT WASHINGTON ATTN CODE 01A
1 CHF AUDIC VISUAL APPLICAT OFC ARMY PICTORIAL DIV OFC OF CHF SIG OFCR
1 CHF PSO RES PROJ ARMY HCSP US MILIT ACAD WEST POINT
1 CO MILIT DIST OF WASHINGTON
1 DIR ARMY LIB PENTAGCN
1 CHF OF MILIT HIST DA ATTN GEN REF BR
1 82D ABN DIV FT BRAGG
1 CO 24TH ARTY GP (AD) COVENTRY
1 CG 31ST ARTY BRGD AIR DEF OAKDALE PENNA
1 49TH ARTY GP AIR DEF FT LAWTON
2 HQ 4/59TH ARTY HAMPTON ROS ARMY TERM NORFOLK
1 28TH ARTY GP AIR DEF SELFRIDGE AFB
1 92D ARTY BRGD AIR DEF HIGHLANDS AFS
1 HQ NIAGARA-BUFFALO DEF 31ST ARTY BRGD AIR DEF LOCKPORT
1 HQ 45TH ARTY BRGD AIR DEF ARLINGTON HTS ILL
1 35TH ARTY BRGD AIR DEF FT GEC G MEACE
1 CG 101ST ABN DIV FT CAMPBELL
1 CG 1ST CAV DIV APC 96490 SAN FRAN
1 US ARMY TROPIC TEST CTR PO DRAWER 942 ATTN BEHAV SCIENTIST FT CLAYTON
2 CINC US PACIFIC FLT FPO SAN FRAN
1 CINC US ATLANTIC FLT CGPC 312A NORFOLK ATTN LTC DOTY
1 CINC PACIFIC OPNS ANLS SECT FPO SAN FRAN
1 CDR TNG COMMAND US PACIFIC FLT SAN DIEGO
1 CHF BUR OF MED + SURG DN ATTN CODE 513
1 CHF NES DIV BUR OF MED + SURG DN
1 HEAD CLIN PSYCHOL SECT PROFESNL DIV BUR OF MED + SURG DN
5 TECH LIB PERS LIB BUR OF NAV PERS ARL ANNEX
3 DIR PERS RES DIV BUR OF NAV PERS
1 TECH LIB BUR OF SHIPS CODE 210L NAVY DEPT
1 BUR OF YDS + DKS DN ATTN ASST CHF FOR RES DEVEL TEST + EVAL
2 NAV AIR SYS COMD REP ATLANTIC NAV AIR STA NORFOLK
1 CO + DIR NAV TNG DEVICE CTR ORLANDO ATTN TECH LIB
1 CC FLT ANTI-AIR WARFARE TNG SAN DIEGO
1 CO NUCLEAR WEAPONS TNG CTR PACIFIC U S NAV AIR STA SAN DIEGO
1 CO NAV AIR DEVEL CTR JOHNSVILLE PENNA ATTN NADC LIB
2 FLT ANTI-AIR WARFARE TNG CTR DAM NECK VA BEACH
2 CC FLT TNG CTR NAV BASE NEWPORT
1 CDR FLT TNG GP NAV BASE CHARLESTON
2 CO FLT TNG CTR NORFOLK
2 HUMAN FACTORS DEPT CODE PSYCHOL DIV NAV TNG DEVICE CTR PT WASHINGTON
1 CO FLEET TNG CTR U S NAV STA SAN DIEGO
1 CLIN PSYCHOL MENTAL HYGIENE UNIT US NAV ACAD ANNAPOLIS
1 PRES NAV WAR COLL NEWPORT ATTN MAHAN LIB
3 CC SERV SCH COMD NAV TNG CTR SAN DIEGO
3 CO NAV GUIDED MSL SCH DAM NECK VA BEACH
2 CO + DIR ATLANTIC FLT ANTI-SUB WARFARE TACTICAL SCH NORFOLK
1 CO NUCLEAR WEAPONS TNG CTR ATLANTIC NAV AIR STA NORFOLK

2 CO FLT ANTI-AIR WARFARE TNG CTR CAM NECK VA BEACH
2 CO FLT SCNAW SCH KEY WEST
1 CO FLT ANTI-SUB WARFARE SCH SAN DIEGO
1 CHF OF NAV RES ATTN SPEC ASST FOR N G O
1 CHF OF NAV RES ATTN HEAD PERS + TNG BR CODE 458
1 CHF OF NAV RES ATTN CIR PSYCHOL SCI-CIV CODE 450
1 CHF OF NAV RES ATTN HEAD OF PSYCHOL BR CODE 452
1 DIR US NAV RES LAB ATTN CODE 5120
5 CO OFF OF NAV RES BR OFFICE BOX 39 FPO 09510 NY
1 CHF OF NAV AIR TNG TNG RES DEPT NAV AIR STA PENSACOLA
3 CO NAV SCH OF AVN MED NAV AVN MED CTR PENSACOLA
1 NAV MED RES LAB NAV SUB BASE GROTON ATTN LIB
1 CO MED FLD RES LAB CAMP LEJEUNE
1 CDR NAV MSL CTR POINT MUGU CALIF ATTN TECH LIB CODE 3022
1 DIR AEROSPACE CREW EQUIP LAB NAV AIR ENGNR CTR PA
1 CO + DIR NAV ELEC LAB SAN DIEGO ATTN LIB
3 OIC NAV PERS RES ACTVY SAN DIEGO
1 NAV NEUROPSYCHIAT RES UNIT SAN DIEGO
2 CDR NAV MSL CTR POINT MUGU CALIF ATTN HUMAN ENGNR DIV CODE N-335
1 DIR PERS RES LAB NAV PERS PROGRAM SUPPORT ACTIVITY WASH NAV YD
1 NAV TNG PERS CTR NAV STA NAV YD ANNEX WASHINGTON ATTN CODE 83 LIB
1 COMDT MARINE CORPS HQ MARINE CORPS ATTN CODE AO-1B
1 HQ MARINE CORPS ATTN AK
1 DIR MARINE CORPS EDUC CTR MARINE CORPS SCH QUANTICO
ATTN SECRET + CONF FILES GP
1 DIR MARINE CORPS INST ATTN EVAL UNIT
1 CHF OF NAV OPNS CP-01P1
1 CHF OF NAV OPNS CP-07T2
1 CHF OF NAV AIR TECH TNG NAV AIR STA MEMPHIS
1 DIR OPS EVAL GRP OFF OF CHF OF NAV OPS OP03EG
2 COMDT PTP COAST GUARD HQ
1 CHF OPCR PERS RES + REVIEW BR COAST GUARD HQ
1 OPNS ANLS OFC HQ STRATEGIC AIR COMC OFFUTT AFB
1 AIR TNG COMD RANDOLPH AFB ATTN ATTTM
1 HQ AIR TNG COMD ATTES RANDOLPH AFB
1 CHF SCI DIV OACTE SCI + TECH DCS R+D HQ AIR FORCE AFRSTA
1 CHF SPEC WARFARE DIV OACTE CF PLANS + OPNS DCS-PLANS+OPNS HQ AIR FORCE
1 CHF OF PERS RES BR OACTE OF CIVILIAN PERS DCS-PERS HQ AIR FORCE
1 CHF EVAL BR(APPOPCE) CAREER DEVEL DIV OACTE OF PERS PLAN HQ AIR FORCE
2 OPTY INSPECTOR GEN AIR FORCE IAFIAS-GII NORTON AFB
1 FAA CHF INFO RETRIEVAL BR WASH D.C.
1 FED AVN AGY MED LIB HC-640
1 HQ AFSC SCBB ANDREWS AFB
1 ROME AIR DEVEL CTR RASM GRIFFISS AFB
2 CDR ELEC SYS DIV L G HANSCOM FLD BEDFORD MASS ATTN ESRHO
2 SACRAMENTO AIR MAT AREA SPACU-PERS RES MCCLELLAN AFB
1 ATC ATRRQ RANDOLPH AFB
1 HQ BALLISTICS SYS DIV PERS SURSYS BR RSOSP NORTON AFB
2 MILIT TNG CTR OPE LACKLAND AFB
2 6570TH AERO MED RES LAB MAPT WRIGHT-PATTERSON AFB
1 AIR MOVEMENT DESIGNATCH AMRH BROOKS AFB
1 DCS-TECH TNG DIR MILIT + SPT TNG RANDOLPH AFB
2 HQ AIR TRANS COMD ATCTD-M RANDOLPH AFB
1 CDR ELEC SYS DIV LG HANSCOM FLD ATTN ESTI
1 DIR AIR U LIB MAXWELL AFB ATTN AUL3T-63-253
1 DIR OF LIB US AIR FORCE ACAD
1 DRCTE OF AEROSPACE SAFETY AFIAS-L OPTY IG NORTON AFB
1 COMDR ARCTIC AEROMED LAB APO 98731 SEATTLE
1 6570TH PERS RES LAB PRA-4 AEROSPACE MED DIV LACKLAND AFB
1 PSYCHONEUROLOGY PROG NATL SCI FOUND
1 DIR DIV OF DATA SOURCES & STAND NATL CTR FOR EDUC STATISTICS OFC OF EDUC
1 DIR NATL SECUR AGY FT GEO G MEADE ATTN TDL
1 DIR NATL SECUR AGY FT GEO G MEADE ATTN DIR OF TNG
5 CENTRAL INTEL AGY ATTN OCR/DD STANDAD DISTRIBUTION
1 SYS EVAL DIV RES DIRECTORATE COD-OCO PENTAGON
1 DEPT OF STATE BUR OF INTEL + RES EXTERNAL RES STAFF
1 SCI INFO EXCH WASHINGTON
2 CHF REGL TNG BR TNG DIV FED AVN AGY ATTN PT 38
1 BUR OF RES & ENGR US POST OFC DEPT ATTN CHF HUMAN FACTORS BR
1 EDUC MEDIA BR OE DEPT OF HEW ATTN T O CLEMENS
1 CHF PERS RES STAFF OFC OF PERS DEPT OF AGRICUL
1 OFC OF INTERNATL TNG PLANNING & EVAL BR AID WASH DC
2 SYS DEVEL CORP SANTA MONICA ATTN LIB
2 DUNLAP + ASSOC INC DARIEN ATTN LIB
2 RESEARCH ANALYSIS CORP MCLEAN VA 22101
1 DIR RAND CORP SANTA MONICA ATTN LIB
1 U OF ILL GP EFFECTIVE RES LAB
2 U OF SO CALIF ELEC PERS RES GP
1 COLUMBIA U ELEC RES LABS ATTN TECH EDITOR
1 METRE CORP BEDFORD MASS ATTN LIB
2 U OF PGH LEARNING R+D CTR ATTN DIR
1 HUMAN SCI RES INC NORFOLK
1 WESTERN ELECTRIC CO INC NY
1 HUMAN SCI RES INC MCLEAN VA
2 TECH INFO CTR ENGNR DATA SERV N AMER AVN INC COLUMBUS O
1 CHRYSLER CORP MSL DIV DETROIT ATTN TECH INFO CTR
1 CTR FOR RES IN SOCIAL SYS AMER U ATTN LIBN
1 RAYTHEON CO ELEC SERV OPNS BURLINGTON MASS
2 EDUC + TNG CONSULTANTS LOS ANGELES ATTN PRINCIPAL SCI
1 GEN DYNAMICS POMONA CALIF ATTN LIB
1 AVN SAFETY ENGR & RES DIV OF FLIGHT SAFETY FOUND INC PHOENIX
2 MARQUARDT CORP POMONA CALIF ATTN DEPT 580
2 OTIS ELEVATOR CO DIV ATTN LIB STAMFORD CONN
1 CHF PERS SURSYS AIRPLANE DIV MS 74-90 RENTON WASH
1 THIOKOL CHEM CORP HUMETRICS DIV LOS ANGELES ATTN LIBN
2 CTR FOR RES IN SOCIAL SYS PLO OFC OF SECY SPEC WARFARE SCH FT BRAGG
1 INST FOR DEF ANLS RES + ENGNR SUPPORT DIV WASHINGTON
1 HUGHES AIRCRAFT COMPANY CULVER CITY CALIF
1 DIR CTR FOR RES ON LEARNING + TEACHING U OF MICH
1 OHIO STATE U
1 EDITOR TNG RES ABSTR AMER SOC OF TNG DIRS U OF TENN
1 U OF CHICAGO DEPT OF SOC
1 CTR FOR RES IN SOCIAL SYS AMER U
6 BRITISH EMBSY BRITISH DEF RES STAFF WASHINGTON
3 CANADIAN JOINT STAFF OFC OF DEF RES MEMBER WASHINGTON
3 CANADIAN ARMY STAFF WASHINGTON ATTN G502 TNG
2 CANADIAN LIAISON OFCR ARMY ARMOR BD FT KNOX
3 ACS FOR INTEL FOREIGN LIAISON OFCR TO NORWEG MILIT ATTACHE
2 ARMY ATTACHE ROYAL SWEDISH EMBSY WASHINGTON
1 NATL INST FOR ALCOHOL RES OSLO
1 DEF RES MED LAB ONTARIO
1 OFC OF AIR ATTACHE AUSTRALIAN EMBSY ATTN: T.A. NAVGN WASH, D.C.
1 YORK U DEPT OF PSYCHOL
2 AUSTRALIAN EMBSY OFC OF MILIT ATTACHE WASHINGTON
2 U OF SHEFFIELD DEPT OF PSYCHOL
1 PENNINGER FOUNDATION TOPEKA
2 AMER INST FOR RES SILVER SPRING
1 AMER INST FOR RES PGH ATTN LIBN
1 DIR PRIMATE LAB UNIV OF WIS MADISON
1 COLUMBIA U SCH OF BUS
3 MATRIX CORP ARLINGTON ATTN TECH LIBN
1 AMER TEL+TEL CO NY
1 U OF GEORGIA DEPT OF PSYCHOL
1 OBERLIN COLL DEPT OF PSYCHOL
1 DR GEORGE T HAUTY CHMN DEPT OF PSYOLU OF DEL
1 GEN ELECTRIC CO SANTA BARBARA ATTN LIB
1 VITRO LABS SILVER SPRING MD ATTN LIBN
1 HEAD DEPT OF PSYCHOL UNIV OF SC COLUMBIA
1 TENN VALLEY AUTHORITY KNOXVILLE ATTN LABOR RELATIONS OFCR DIV OF PERS
1 U OF GEORGIA DEPT OF PSYCHOL
1 U OF UTAH DEPT OF PSYCHOL
1 AMER INST FOR RES PALO ALTO CALIF
1 MICH STATE U COLL OF SOC SCI
1 N MEX STATE U
1 ROWLAND + CO HADDONFIELD NJ ATTN PRES
1 NORTRONICS DIV OF NORTHROP CORP ANAHEIM CALIF
1 OHIO STATE U SCH OF AVN
1 AIRCRAFT ARMAMENTS INC COCKEYSVILLE MD
2 OREGON STATE U DEPT OF MILIT SCI ATTN ADJ
1 TUFTS U HUMAN ENGNR INFO + ANLS PROJ
1 HUMAN FACTORS RES GP WASH U ST LOUIS
1 AMER PSYCHOL ASSOC WASHINGTON ATTN PSYCHOL ABSTR
1 NO ILL U HEAD DEPT OF PSYCHOL
1 DR A. V. FERD STANFORD RES INST FT D
1 BELL TEL LABS INC TECH INFO LIB WHIPPANY LAB NJ ATTN TECH REPORTS LIBN
1 WASHINGTON ENGNR SERV CO INC KENSINGTON MD
1 LIFE SCI INC FT WORTH ATTN PRES
1 AMER BEHAV SCI CALIF
1 SAN DIEGO STATE COLL PUBLIC ADMIN CTR
2 DIR INSTR RESOURCES STATE COLL ST CLOUD MINN
1 COLL OF WM + MARY SCH OF EDUC
1 SC ILLINOIS U DEPT OF PSYCHOL
2 COMMUNICABLE DISEASE CTR DEVEL + CONSULTATION SERV SECT ATLANTA
2 WASH MILITARY SYS DIV BETHESDA MD
1 RCA BURLINGTON MASS ATTN: WM A BUSH
1 NORTHWESTERN U DEPT OF INDSTR ENGNR
1 HONEYWELL ORD STA MAIL STA 806 MINN
1 NY STATE EDUC DEPT ABSTRACT EDITOR AVCR
1 AEROSPACE SAFETY DIV U OF SOUTHERN CALIF LA
1 MR BRANDON B SMITH RES ASSOC U OF MINN
1 CTR FOR THE ADVANCED STUDY OF EDUC ADMIN ATTN IONE PIERRON U OF OREG
1 CHF PROCESSING DIV DUKE U LIB
1 U OF CALIF GEN LIB DOCU DEPT
1 FLORIDA STATE U LIB GIFTS + EXCH
1 HARVARD U PSYCHOL LABS LIB
1 U OF ILL LIB SER DEPT
2 U OF KANSAS LIB PERIODICAL DEPT
1 U OF NEBRASKA LIBS ACQ DEPT
1 OHIO STATE U LIBS GIFT + EXCH DIV
1 PENNA STATE U PATTEE LIB DOCU DESK
1 PURDUE U LIBS PERIODICALS CHECKING FILES
1 STANFORD U LIBS DOCU LIB
1 LIBN U OF TEXAS
1 SYRACUSE U LIB SER DIV
1 U OF MINNESOTA LIB
1 STATE U OF IOWA LIBS SER ACQ
1 NO CAROLINA STATE COLL CH HILL LIB
2 BOSTON U LIBS ACQ DIV
1 U OF MICH LIBS SER DIV
1 BROWN U LIB
2 COLUMBIA U LIBS DOCU ACQ
1 DIR JOINT U LIBS NASHVILLE
1 U OF DENVER MARY REED LIB
2 DIR U LIB GEO WASHINGTON U
2 LIB OF CONGRESS CHF CF EXCH + GIFT DIV
1 U OF PGH DOCU LIBN
1 CATHOLIC U LIB EDUC & PSYCHOL LIB WASH DC
1 U OF KY MARGARET I KING LIB
1 SO ILL U ATTN LIBN SER DEPT
1 KANSAS STATE U FARRELL LIB
1 BRIGHAM YOUNG U LIB SER SECT
1 U OF LOUISVILLE LIB BELKNAP CAMPUS

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